AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN NOVEMBER, 1830.

With Remarks and Exemplifications, by the Editor.

(Concluded from page 84.)

14. For machinery for *Planting and Digging Potatoes*, and for ploughing corn, potatoes and other plants; Phineas Meigs, and Matthew C. Arnold, Madison, New Haven county, Connecticut, November 3.

The machine which serves as the foundation of the different operations, is framed together much in the manner of a common plough. There are various distinct parts, which are capable of being attached or removed at pleasure. Thus a double or single mould board may be used. A kind of harrow, may be attached to the beam behind the mould board, to collect the potatoes; and several other contrivances are represented in the drawing, some of which, we doubt not, may be advantageously employed. The whole is clearly explained, and distinctly represented in the drawings. The claim is to the construction of the machine as described, which is capable, by changing its parts, of performing the different purposes specified; the mode of combining and fastening the different parts; and the application of steel plates, and nose pieces, which may be renewed at pleasure.

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15. For *Combined Spiral Springs, for Clocks;* Silas B. Terry, Plymouth, Litchfield county, Connecticut, November 3.

The object of this invention is to combine several spiral springs together, in such a way, that a clock when wound shall run three or four times as long as with a single spring.

The patentee says, "instead of a single spiral spring, such as is commonly used for spring clocks, or time pieces, I employ two, three, four, or more, such springs, but made narrower than those which are usually employed; so that two, three, or more, need not collectively be wider than the common clock spring.

"I sometimes enclose each spring in a barrel, resembling the barrel usually employed, but only of sufficient depth to receive the spring. Such barrels and springs may be connected with each other, and made to act in combination.

"Instead of forming a barrel, I sometimes use a circular plate, having near its periphery a number of projecting pins. These projecting pins answer the purposes of the rim in the barrel, as they retain the spring in its place, and one of them serves to fasten its outer end, by merely giving it a turn, that it may slip over one of the pins. A circular piece is fastened on the opposite side of this plate, to receive the inner end of a spring.

"Upon this plan, such a number of springs may be added as shall

give the desired number of turns, and a wheel and pinion be saved in the construction of a time piece.

"From the great length of spring afforded by this combination, a uniformity of action is secured, which will cause a time piece to which it is applied, to act with greater regularity without a fusee, than is possible with the ordinary spring; whilst from its great flexibility, the spring is less liable to break, or to fail in any way.

"What I claim as my invention, and for which I ask a patent, is the combining, or connecting together, a number of spiral springs, upon the principle, and for the purposes herein before described."

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16. For a machine for *Washing Gold;* Daniel Jones, Granville county, North Carolina, November 3.

The mode of agitating the earth to be washed, and of supplying a stream of water to effect the object, is very similar to methods which we have before described; the patentee does not tell us in what his invention consists, or make any claim to any part of the machinery.

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17. For a *Machine for Scraping the Flesh and Hair from Hides and Skins, and Dressing the same;* Thomas Williams, Rochester, Monroe county, New York, November 4.

(See specification.)

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18. For an *Inking Apparatus*, being an improvement on the inking apparatus of 'Neal's Vertical Printing Press,' and applying the same to other presses; Rich Wood, City of New York, November 4.

(See specification.)

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19. For an improvement in the *Cotton Press;* Joseph Carson, Raleigh, North Carolina, November 4.

The press here described is a rack and pinion press, so arranged as to be conveniently employed in the pressing of cotton.

The shaft of the pinion is vertical, and a braced beam extends horizontally from it, to move it by horse or other power. The lever must be of such length, as to enable the horse to walk clear of the frame work of the press. A stout piece of timber, provided with teeth, form the rack, and forces up the follower against the cotton. The mode of framing, and the appurtenances for forming the bales with convenience, do not differ from those previously used in other cotton presses.

The whole machinery is described, but no claim made. We are not aware, that, in the present instance, the omission is of any importance.

20. For a *Washing Machine;* Gideon Lowell, Nunda, Allegany county, New York, November 6.

This, like numerous other washing machines, has a cylinder, the periphery of which consists of circular rollers; the gudgeons of this cylinder rest upon the edges of a trough. The article to be washed is placed between the cylinder, and circular rollers crossing the trough. Springs are used to regulate the pressure. The cylinder is to receive a vibratory motion.

The patentee tells us, that "the improvement claimed *on* the above described machine is the whole, except the box or sink, and that made 2 inches wider, which is a great advantage in washing large clothes." We do not know whether or not it is intended to claim the two inches; perhaps, however, it will be best to do so, as they will distinguish this machine from others, as clearly as its other novelties.

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21. For a *Machine for Thrashing Grain and Clover Seed;* James Darrah, Corkstown, and Jacob Kinsey, Ruscomb-manor, Bucks county, Pennsylvania, November 6.

The cylindrical beaters are in the common form, fluted upon their edges. The hollow segment consists of rollers of cast or wrought iron, turning on pivots, and the bars twisted in reversed directions. A simple fluted bed is to be used for clover seed.

"The *Invention* here claimed, is the double frame, to enable the cylinder to run in three boxes." That is, the shaft of the cylinder has three bearings, one on each side of the wheel by which it is to be turned, and one at the opposite end. "The bead in the boxes with the corresponding groove in the spindle." The common plan of a fillet on one of the boxes, and a groove in the spindle, operating like the swell on a grindstone spindle, is here intended; for although not mentioned in the description, this fillet appears in the drawing.

"The screw rollers and side plates, with the bolts and spiral springs. The additional roller in the feeding apparatus, and the fluted bed to be used for clover seed."

It is one of the most difficult points in a specification, even where a machine possesses much of novelty, to "distinguish the same from all other things heretofore known or used." This difficulty must necessarily increase with the want of originality in a machine, but even in such a case it may be as well to say little or nothing about it, and it certainly would be prudent to avoid claiming as new, what every tyro in mechanics knows to be far older than himself.

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22. For a mode of *Uniting Timber in Building Domes, Bridges, &c.;* William Annesley, Albany, New York, Nov. 6.

(See specification.)

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23. For improvements in the *Mode of Building Vessels;* William Annesley, Albany, New York, November 6.

(See specification.)

25. For an improved labour-saving *Tanning Apparatus;* William Brown, City of New York, November 11.
(See specification.)

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26. For an improvement in the *Power Loom;* John Standish, Belfont, Providence county, Rhode Island, November 11.

"My improvement in weaving consists in pressing the cloth beam against the yarn beam, by levers, as is clearly explained in the drawing annexed, fully complying with the requisitions of the patent act. The advantage resulting from my improvement, is in consequence of the two beams revolving with equal motion. As the yarn is discharged from the yarn beam, the cloth is wound upon the cloth beam with an equal, steady motion; avoiding the inequalities in the cloth as woven in the usual method."

The foregoing sententious paragraph, comprehends nearly the whole of the specification. In it is contained the description of the machine, an account of its utility, and a decision that the patent law has been fully complied with. We hope for the sake of the patentee, that the plan may be found to be new, useful, and profitable.

The arrangement is well represented in the drawing. The gudgeons of the cloth beam run in moveable uprights, connected together by a bar, and are operated upon by a weighted lever. No machinist would be at a loss in carrying the plan into operation, the simple idea being once given.

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27. For an improvement in the *Temple of the Common Power Loom;* John Standish, Belfont, Providence county, Rhode Island, November 11.

The specification of the temple is about as short as that of the power loom; it refers, however, throughout, to the drawings which accompany it; these are so wretchedly executed, that we could not undertake the task of deciphering them.

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28. For improved *Fire Engines;* John James Giraud, Baltimore, Maryland, November 11.

We have more than once met with Mr. Giraud, in our visits among the patentees, and we recollect that his anticipations are always of an elevated character. In the case in hand he has taken care not to fall below his ordinary level. In his peroration the patentee informs us that by his "improvements in hydraulics and fire engines, water may be thrown double the distance as is accomplished at present, and with very little power."

The description then informs us that two cylinders, each with caps or domes, are to be placed one within the other, a space of an inch being left between each; but as one of the cylinders is to be six, and the other five inches in diameter, we should have looked for only half an inch of space between the two. The inner cylinder is to be suspended within the outer, and its lower edge is not to reach to

the bottom, as it is to operate as an air chamber. The lower end of the outer cylinder is to be closed by soldering a bottom on to it. The particular form of some of the parts cannot be given without a drawing, and this we do not think the occasion justifies. The part which we have described operates simply as the common air vessel. Two openings are to be left in the bottom of this vessel, which are to be covered with valves. Two forcing pumps constructed in the manner of those used in other fire engines are to force the water into the air vessel. A pipe to receive the goose neck, passes through the domes or caps, of the two first described cylinders.

We now quote the patentee.

"Upon the same principle may be constructed a great reservoir for atmospheric air, and to raise water of itself to a certain height, by pressing this air by means of a pump of a suitable construction, with weights attached to the piston to produce a pressure calculated to raise the water to a given elevation.

"I claim my principle as here described, not only to convey water, but also with the same mechanical means, fire and steam, fluids of every description, gases, &c. single or compounded. I also claim my principle applied in any manner whatsoever, to machinery of every and all descriptions. J. J. GIRAUD."

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29. For an instrument for *Stemming of Dry Tobacco;* Germain Bréant, City of Richmond, Virginia, November 11.

A strip of steel about eight inches long is fixed upright upon a table. Through this strip there are three holes of different sizes; the stem is to be drawn through one of these holes, when its sharp edge will strip the leaf from the stem. The strips, the patentee says, are much more perfect than those obtained by hand. The quantity of leaf is greater, and a new hand can perform the work with the same facility as an adept.

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30. For a *Rotary Straw Cutter;* Samuel Wilson, Darlington District, South Carolina, November 11.

A solid wheel is made to turn by a crank, in the manner of a grind stone. On the flat face of the wheel, on the side opposite to the crank, is fixed three, or any other number of cutters, in the direction of radii of the wheel; these steel cutters stand out from the face of the wheel, at a distance equal to the length of the intended cut straw. The straw is placed in a trough, and is to be fed to the cutters by hand or otherwise. The claim is as follows.

"What I claim as new in this invention, is the arrangement of the cutters on the face of the solid wheel, in the direction of the radii of the wheel, and at a distance from the face of the wheel, equal to the required length of the cut straw. I further claim as new, the iron, or steel fixture on the reversed face of the wheel, nearly opposite each other, and rubbing against the iron fixture in the frame, which prevents the wheel and the cutters springing from the fixed plate, which forms a part of the shear, or cutter."

Where the straw is fed by hand, the solid wheel offers some advantage, but where it is fed by rollers, as in numerous straw cutters, it affords none. The cutters forming radii to the wheel, is far from being an improvement upon those which are curved, or which form an angle with the radii. The general structure of this machine seems to us to possess no just claim to novelty.

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31. For an improvement in the manner of *Covering the Roofs of Houses with Plates of Tin*, Copper or Zinc; Peter N. Ware, Albemarle county, Virginia, November 11.

"The said improvement consists in locking, or grooving the sheets together at the bottom, as well as on the sides, and securing each sheet as it is put on, with hooks of the same metal, at top, and on the side; the hooks being nailed on to the sheeting plank. The advantages are evident, as not a single nail passes through any one sheet of the entire roof, except on the outer edges. The locking at bottom prevents the draft of air which causes leaks."

The foregoing is the whole of the specification. The patentee is mistaken in supposing, that the grooving of the sides and bottoms of such plates, is a new invention.

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32. For a *Self Tightening Sacking Bottom Cot Bedstead;* Peregrine Williamson, City of New York, November 11.

There seems to be a little too much complexity about this self tightening cot. A description of it would not be very intelligible without a drawing; and we pass over many things to which we would more willingly afford one. If the invention possesses a moiety of the virtues ascribed to it, it is a very good thing. The claims are not few in number, and, we think, not all original; among them are, the application of a mortise in the legs, which mortices are slots, allowing the pin of the stretcher, which extends from one pair of legs to the others, to slide in them; the application of rails inserted into the head and foot boards, so as to revolve on their axes; the application of wheels to the feet; the supporting bar, with the piston rod attached; the application of a stretcher to the centre of the legs; the lever fastening; the application of slots, and also detachable woven cord bottoms to cots, &c. &c.

We have frequently seen stretchers to the legs, and detachable bottoms, attached to the rails by pins, as shown in the drawing. If there is any thing new in the mode of applying them by the present patentee, we do not understand his description.

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33. For an *Apparatus for Holding Tow Lines*, and for other purposes; Robert Davis, Philadelphia, Pennsylvania, Nov. 11.

This apparatus is a kind of double lever, working upon a pin something like a pair of shears, a spring operates to close the ends which are to hold the tow line; these ends have a cavity through

which the line passes. When, to prevent accident, it becomes necessary to detach the tow line, the upper lever is to be pressed down, and the line liberated. The apparatus appears to be simple, but it is not clearly described.

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34. For an improvement in *Cider Mills;* Charles Rice, Barre, Worcester county, Massachusetts, November 11.

This cider mill and press are placed upon wheels, to move them from place to place. There is a sweep, attached to an upright shaft, to be turned by horse power. The apples are put into a hopper, at the lower part of which is a cylinder with teeth, by the revolution of which they are ground. The pommage falls into a square or circular rack, or cage, in which it is to be pressed. At the bottom of this cage there is a follower, which may be drawn up by two screws, the cider then runs down into a trough below.

"The *invention here claimed*, and for which a patent is desired, is the press; the rack; and the arrangement of the different parts of the mill as before described."

This claim we think much too indefinite, as there are other patented cider mills in which some of the arrangements are essentially the same with the present.

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35. For an improved *Cloth Mangle;* Thomas Rundle, Boston, Massachusetts, November 11.

In this machine, the mangling is to be performed between cylinders, without a traversing box. The method of making the whole is illustrated by drawings, referred to throughout. The admeasurement of the different parts is given with minuteness, but we are not told in what the novelty of the machine consists, nothing appearing in the form of a claim. The use of rollers, pressed together, instead of a loaded box, is certainly not new, yet according to the tenor of the specification, the whole machine must be considered as claimed.

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36. For an improvement in the *Lathe* for shaping various articles of irregular form, according to a pattern; Elias Rhodes, Kingsbury, Washington county, New York, November 11.

The specification commences by informing us that the "species of lathe to which this improvement is applicable, has been in use for a number of years past, for the shaping of gun stocks, and other articles of irregular figure according to a pattern of the article to be formed. The general principle of its operation is well understood, and will therefore require but a brief description."

After giving this brief description, it is said,

"What I claim is the application of one or more circular saws to the above described lathe, for the purpose of shaping axe helves, wagon spokes, or any other article which may be shaped therein, excepting lasts and hat blocks."

This is rather a curious kind of claim, and one which is based

upon a common, but very mistaken notion. The patentee does not pretend to have invented the machine, and excepts lasts and hat blocks from his claim, because they are made in a similar lathe. It has been decided in court, and the decision rests upon the plain dictates of common sense, that to apply an old machine to a new purpose, is not an invention, or discovery, for which a patent can be sustained.

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37. For an improvement in *Spinning Cotton Yarn, &c.* being improvements in his running cap spinner, &c.; John Thorp, Providence, Rhode Island, November 11.

The specification of this patent was published in our last volume, page 288.

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38. For an improvement in the machine for *Thrashing Grain and Hulling Clover Seed;* Leuman Cooley, City of Philadelphia, November 11.

This thrashing machine differs not, in its general structure, from the great family of that name. The beaters are not to run in a straight line from one end of the cylinder to the other, but are to be bent in curves, or to form angles, that they may strike the grain obliquely. The claim is to "the angular, or curved beaters, they having a tendency to spread the grain equally over the cylinder, before coming in contact with the concave bed, and also preventing the whole length of the beater from striking the grain at the same time, and causing less friction."

"Placing of the concave half circle, or bed, round the end of the machine, which admits a much greater concave than can be obtained in any other way; consequently the cylinder may be placed at a greater distance from the concave bed, thereby admitting a larger quantity of grain, as the cylinder has a more extended space to act upon it. It also separates at the same time the grain from the straw."

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39. For a *Combined Plough;* Samuel Cline, New Britain, Bucks county, Pennsylvania, November 12.

This combined plough is intended for ploughing in light, free soils. There is a beam with handles attached in the usual manner; the ploughs, however, are not fixed to this, but to a second beam which crosses it at an angle of 45 degrees. To the transverse beam it is proposed to affix five ploughs; the centre one standing at the point where the transverse is attached to the ordinary, or longitudinal beam. This may be called the centre plough. The transverse beam is about 5 feet in length, the ploughs placed about 14 inches apart, causing them to cut about ten inches each. The ploughs consist simply of a mould board, landside, and sheath, or standard. The mould board is drawn and flattened out so as to supply the place of a share. The sole of the plough is not much to exceed its

extreme breadth. Ten inches in length, and eight in breadth, it is said, has been found to answer perfectly well.

"Two horses are able to work this combined plough quite easily, and to pass over as much land in a day as three teams of two horses with the common single plough." So avers the patentee.

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40. For an improved *Fire Proof Chest;* John Scott, City of Philadelphia, November 12.

The patentee claims to have made various improvements in the fire proof chest, and in doing so we are more than apprehensive, that he has included things which are without the shadow of novelty. We give the first as an example.

"Sec. 1. I improve the incombustibility of the wood used, by steeping it in a composition of water with salt, and pot and pearl ashes; the precise proportion of each not being material. The use of the pot and pearl ashes in this way, and for this purpose, instead of common wood ashes, constitutes this portion of my improvement."

Now there is just as much difference between the ley from common wood ashes, and a solution of pot and pearl ashes, as there is between brine and salt and water, potashes consisting entirely of the saline matter which is left after evaporating the water from common ley. There is no novelty in this application.

The second improvement consists in covering the wood with a coat of glue and emery.

The third in making drawers of tin, instead of wood.

The fourth is in the form of the castor, which consists in making some parts of it rounding which have *sometimes* been made flat.

There are in the whole ten sections, each referring to a particular improvement, so called, and some of them probably deserving the name; but in taking out a patent, if a new piece is put upon an old garment, the rent is made worse, by at least thirty dollars.

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41. For a mode or manner of *Supplying the Boilers of Steam Engines with water;* John S. Williams, Maysville, Mason county, Kentucky, November 17.

(See specification.)

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42. For an improvement in *Monuments, Memento Plates, Statues, and Mantel Pieces,* by the application of cast iron instead of stone or wood; Henry Libeneau, City of New York, November 17.

This patent is taken for making the foregoing articles of cast iron. In the specification we meet with calculations of the relative cost of cast iron and stone, and have an essay upon the subject rather than a description of what the patentee has invented. There is no claim made, and the whole, therefore, is patented. We have no confidence in the validity of such a patent; or rather we feel confident

that it is altogether invalid. Cast iron mantels, and, indeed, articles of almost every description to which this material is applicable, are made in England, and have been in use for many years.

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43. For a machine for *Raising Mud, Sand, or Gravel, from the Beds of Streams, Rivers, and Harbours;* Elisha H. Holmes, Norwich, New London county, Connecticut, November 18.

The general structure of this machine is similar to some of those now in use for the same purpose. The patentee says, "some of the advantages gained by my improvements, are the facility and despatch with which the machine is operated. Heretofore the shovel has been brought back by hand, by a crank on the stern of the boat, whereas it is now brought back by the horses, or whatever other power may be applied."

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44. For a method of *Ornamenting Horn and Tortoise Shell Combs*, so as to resemble carved work; Maulby J. Littleboy, City of Philadelphia, November 19.

This patent is obtained for pressing tortoise shell and horn combs in dies, by the aid of heat. Combs so ornamented have been imported in great numbers from India. This mode of ornamenting articles made of these materials is one of the best known processes in the mechanic arts; still the patentee claims "the method of putting an ornament, or impression, upon horn and tortoise shell combs, so as to resemble carved work, by dies, heat, and pressure."

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45. For a *Kitchen Grate;* Levi Disbrow, City of New York, November 22.

This, which the inventor calls the JACKSON GRATE, is for burning anthracite coal, and is made exactly like the grates most commonly used for that purpose, but of greater length. To regulate the size of the fire he uses partitions of iron which are moveable, and extend from the front to the back of the grate. We are told that there may be an oven attached, if required, and that the crane should be strong enough to bear what is hung on it, which is certainly very proper. "The patent is not claimed on the grate alone, but as to the manner of applying it to use." This is all that appears in the form of a claim, and as we do not clearly understand what is meant by it, we leave it to the judgment of our readers.

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46. For a machine for *Washing of Clothes,* scouring of yarn, &c.; J. Tenny, New Woodstock, Madison county, New York, November 23.

A swing frame with a roller at the bottom of it, is made to vibrate by hand; the clothes are placed in a trough with a bed piece of suitable curvature.

There is no claim, and as similar machines have been long since

patented, tried, and abandoned, we apprehend that the want of a claim will not be a source of loss.

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47. For a machine for *Hulling Clover Seed, Rice, &c.;* William Manning, Westfield, Essex county, New Jersey, Nov. 24.

The invention claimed is "the mode of hulling clover seed, rice, barley, and other small grain, by the revolution of a cylinder in a curved hollow bed, covered with wire, or other teeth."

We know of no method more commonly adopted than that of hulling by a cylinder set with teeth, and working in a concave bed, it is probable, therefore, that this machine, if well made, may, in one respect, fulfil the anticipations of the patentee; we were going to say of the inventor, but he, undoubtedly, has "passed the bourne."

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48. For an improvement in *Clocks and Time Pieces;* Jacob D. Custer, Norristown, Montgomery county, Pennsylvania, November 24.

The specification of this patent is by no means a description. A drawing accompanies it, but this is without written references. A model is referred to throughout, which model is in the patent office, and is incapable of publication.

This mode of procedure is altogether incorrect, and insufficient. The model is a mere contingency, and it is requisite that the invention should be made fully known without any reference to it.

What appears in the form of a claim we will copy, although it will afford but little light respecting the nature of the thing patented.

"The following are the parts improved, which your petitioner claims. The whole of the moving works except the weights and line. And the whole of the striking and alarm works except the barrel wheel and its line and weight. And the piece that comes out through the dial, at the left side, to set it to strike, or strike and alarm, or alarm only, or neither strike nor alarm. And the main wheel, and the date wheel, and the case. And the fly wheel and verge, or pendulum and verge, or scales and verge, to regulate the stroke. And the hammer with a spring as common clocks. And the bell on the top as in common clocks. And the time piece the same as the moving works of this model. And the application of those striking, or alarm works to watches. And the application of those striking or alarm, or moving works to clocks made in the common way, and wooden clocks made after this plan."

JACOB D. CUSTER.

The foregoing claimer, and disclaimer, is a fair sample of the clearness, or rather of the ambiguity, of five closely written pages of description. Those who do not understand the thing from the foregoing, are referred to the model room at the patent office.

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49. For a *Thrashing Machine;* Alonzo S. Smith, Brutus, Cayuga county, New York, November 24.

The usual cylinder with teeth, and a hollow segment form the

operative parts of this machine. There is a long list of claims for the particular mode of forming and arranging certain parts, but we do not see in it any thing particularly worthy of notice.

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50. For an improvement in the *Machine for Dressing Hemp and Flax;* Joel Dewey, jr. Troy, Rensellaer county, New York, November 25.

This machine is much less complex than most of those used for flax dressing; and this would be no small praise, provided it was equal to them in operation. It appears to us, however, to be an improvement somewhat like those which have been proposed in the steam engine, by individuals unacquainted with its history, who have gone a hundred years back, and patented Capt. Savary's over again.

The patentee uses what he calls a swingling cylinder. This consists of four arms, each carrying a wooden knife. The hemp or flax is to be allowed to hang over a bar, or hanging piece, in such a way that the knives may operate upon it. There are, altogether, *two* fluted rollers between which the hemp, or flax, is to be passed. The lower is to be pressed against the upper roller by a weighted lever, or bar, in a well known manner. The claim is "the way of making the fluted rollers. The manner of weighting and graduating said rollers; also the manner of constructing the swingling cylinder, and hanging piece to swingle over."

What is the particular "way of making the fluted rollers," we are not told; and in fact, the whole machine is very imperfectly described, and badly represented in the drawing.

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51. For an improvement in the art of *Manufacturing all kinds of Bottles, Decanters, and other pressed hollow Glassware,* with the neck or apertures smaller than the cavity or inside diameter of the vessel; John M'Gann, Kensington, Philadelphia county, Pennsylvania, November 26.

When a decanter, or similar vessel, is to be made, there are to be two moulds, with their proper presses. In one mould the lower part of the decanter is formed, in the other, the upper part and neck. One of the moulds is fixed to a hinge in such a way, that when the cores of the two parts are withdrawn, one mould will turn over upon the other, and bring the edges of the glass into exact contact, when, by a slight pressure, they are made to adhere; the moulds are then opened, and the decanter removed from it.

The claim is to that construction of the cores and moulds which enables the operator to form vessels of glass, in the way above described.

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52. For an instrument for *Cutting Channels for Seams, in the Soles of Boots and Shoes;* James Cole, East Bloomfield, Ontario county, New York, November 26.

This instrument consists of a knife which projects from the end

of a piece, or pieces, of wood, formed in the manner of the shoulder piece, used by shoemakers.

The knife has a slot in it, and is fixed by means of a screw, allowing it to be set so as to cut to a greater or less depth. The claim is to the construction and use of such an instrument.

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53. For an improvement in the *Mode of Combining Printing Types for Music;* George Bruce, city of New York, November 27.

(See specification.)

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54. For a *Fan moved by Mechanism, for bed chambers, dining rooms, halls, &c.;* James Barron, Norfolk, Norfolk county, Virginia, November 27.

Four wheels and four pinions are to be fixed in a suitable frame. A barrel, like a clock barrel, with a weight and line attached to it, is to be wound up to keep the fan in motion. It is so calculated as to run about eight hours. A crank upon the shaft of the last pinion, gives motion to a rod, which is to vibrate like a pendulum rod; upon the end of this rod the fan is placed.

"The improvement here claimed is the above described machine for fanning bed chambers, dining rooms, halls," &c.

The foregoing is certainly a very complex mode of attaining the proposed object. We should find no difficulty in making a much more simple instrument for the purpose, and which certainly would not interfere with the claim to "the above described machine."

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55. For a *Thrashing Machine;* Samuel Turner, and Norris Barnes, Aurelius, Cayuga county, New York, November 27.

Another cylinder, and another hollow segment, are united together, and these twain, as heretofore, form one thrashing machine. The segment is to be of cast iron and fluted, the beaters are to be formed of square bars of wrought iron, and twisted, and "the particulars which the petitioners claim as their invention and improvement, are the reeded and fluted bed for the cylinder; and the peculiar position and construction of the Beaters on the cylinders. But they claim the right of every modification of said improvement, which is consistent with the principle of the same as herein described and specified."

There have been so many *modifications* of the same *principle*, previously patented, that the acquiescence of certain individuals in the claim here set up, is a point which verily admits of some doubt.

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56. For a *Thrashing Machine*, called Flagg's Rotary Thrashing Machine; David Flagg, jr. City of New York, November 29.

There are two, or more, cylinders with rows of teeth upon them;

the teeth of one cylinder being made to pass in the spaces between the teeth of its antagonist. We are told, however, that a hollow bed with teeth, may, in some cases, be substituted for one of the rollers.

The claim is to "the manner and form in which the cylinders operate together, as above described, for the aforesaid purposes."

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57. For a *Rotary Steam Engine and Boiler;* Caleb Tompkins, Montgomery, Montgomery county, Alabama, November 30.

The history of rotary steam engines, is a history of failures, in which much talent and money have been spent, and, hitherto, to no good purpose; many of the best practical engineers are now satisfied that the rotary will never supersede the reciprocating engine. The engine described by the present patentee, does not afford any thing new in principle, and its details are so imperfectly described, and so obscurely represented in the drawings, that it offers nothing to justify an augury in its favour. There is no claim made to any part. The anticipations of the patentee are, as is frequently the case, of a character somewhat too magnificent; they are manifestly theoretical, as we are very certain that a practical essay would have subtracted much from the sum entered on the credit side.

The boiler described is 3 feet in diameter, and 10 feet in length, and we are told that "this engine is capable of producing 200 horse power, as is calculated at present, and can be practically used in all cases where steam power may be required, for boats, carriages, factories, mills, and in all other places." "The use of this engine and boiler, will render the use of steam full fifty centum less expensive than those now in general use." Perhaps so, but we "have little hope, and no confidence."

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for improvements in the Saw Set. Granted to EBENEZER WHITING, *Berkshire, Tioga county, New York, October* 15, 1830.

To all whom it may concern, be it known, that I, Ebenezer Whiting, have invented certain improvements in the saw set, which improvements are applicable to saws of all descriptions, and that the following is a full and exact description of the same.

The saw set which I use operates upon the principle of punching, and is represented in the drawings which accompany this specification. Fig. 1, exhibits a convenient form for the saw set when used for hand, panel, or other similar saws. It has a shank by which it may be firmly fixed in a vice, or in a hole made in a bench for that purpose. The punch is sustained by a spring attached to the iron support, which is usually cast in one piece with the shank. A piece of tempered steel is let into the iron, immediately under the punch, and forms the bed between which and the punch the saw

tooth stands when it is to be set. There are two pins, or wires, which serve as guides to the saw teeth as they are successively set. The punch is filed so that its two sides which meet between the pins, form an acute angle, so as to be adapted to the form of a saw tooth. A plate of brass, or other metal, upon which the blade of the saw is to rest, is made to raise, or lower, by means of screws, which are tapped into the iron part of the frame through which they pass, and swivel in the plate above. A bent spring bears upon the heads of the screws, to retain them in their places. (See Fig. 1.)

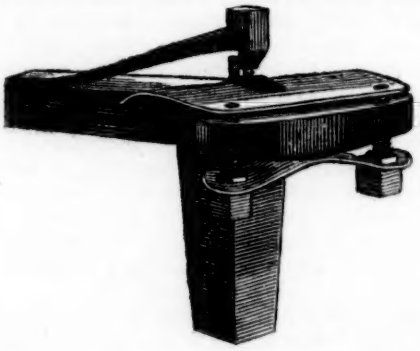


Fig. 1.

Fig. 2, is the same principle adapted to saw mill, cross cut, and other large saws. The pins which guide the teeth are not seen in the drawing, as they are hidden by the punch. They rise, however, from a steel bed, as in the former instance, and the punch, instead of being filed to an acute angle, is left square, and has two holes drilled in its face to admit the pins, and allow the punch to play. There are two screws by which to regulate the set of the saw, and also a bent spring. There is, on the back, a mass of cast iron which serves for a handle, and at the same time by its inertia, sustains the stroke of the hammer when a tooth is set.

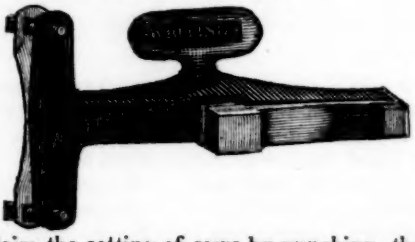


Fig. 2.

I do not claim the setting of saws by punching, the same having been heretofore practised; but what I claim as my improvements, are, the use of the two pins to guide the tooth of the saw; the making of the iron frame so that the limbs which contain the screws form a T with the body of the instrument; the mass of metal to prevent the recoil of the instrument when struck with a hammer; the manner

in which the set is regulated by means of the screws, and the general arrangement of the whole to produce the intended effect.

Ebenezer Whiting.

Specification of a patent for a machine for Scraping the Flesh and Hair from Hides and Skins in the process of Tanning, and for Dressing the same, and also for all other scraping necessary in tanning, currying, and leather dressing. Also for cleaning wool on sheep skins, and taking the same therefrom. Granted to Thomas Williams, *Rochester, Monroe county, New York, November* 4, 1830.

This machine consists of a wooden frame, in which is set a cylinder of wood furnished with four knives of steel or iron, so placed upon the cylinder as to form obtuse angles on opposite sides of the same. The cylinder is turned by horse or water power, or may be turned by a crank by hand. The object of the knives is to scrape the flesh, or hair, from the hides or skins; the edges may be made sharp, or obtuse, according to the purpose for which they are used. The hide, or skin, is placed beneath the cylinder between that and a bed piece, which bed piece is so made as to fit the lower surface of the cylinder. The hide, or skin, is carried under the cylinder, and kept smooth by the angular and spiral position of the knives. The object of the bed piece is to press the hide or skin equally upon the edge of the knife. The pressure is regulated by a weight attached to two levers, by which the bed piece is raised or lowered. These levers are attached to a weight which consists of a box or trough filled with weights; or, instead of a trough and weight, a spiral spring. This weight is raised or lowered by means of another lever, placed on the frame work, above, and connected with the weight by a rod or line. There is a small cylinder placed parallel to the one above described, and turned by a crank. The object of this cylinder is to wind up the hide or skin after it has undergone the process of scraping from the knives; the hide or skin is attached or fastened to the last mentioned cylinder, by pressing a part of it into a long mortise with a bar made to fit the mortise.

Thomas Williams.

Specification of a patent for an Inking Apparatus; being an improvement on the inking apparatus of Neal's vertical press, and applying the same to other presses. Granted to Richard Wood, *City of New York, November* 4, 1830.

In the application of this machine, the operator in turning the rounce handle, in order to run the bed, or coffin, of the press under the platen, turns the arbor which is connected with the rounce, which, drawing upon the strap fastened upon the barrel contiguous to the bevel wheel, winds up the weight hung upon the barrel, upon

the sliding shaft to which this strap is attached; at the same time turning the two distributing rollers. In reversing the motion of the rounce, in order to withdraw the bed, the other barrel upon the arbor being held against the immoveable ratchet by the spiral spring, winds up the weight upon the other barrel of the sliding shaft; the motion of the arbor being reversed, the strap upon the other barrel unwinds from the barrel, and, the tympan being raised, pressing upon one of the levers before mentioned, bears off the barrel from the ratchet, and allows the strap on that also to unwind: the frisket being now raised; pressing upon the other lever, trips the catch which holds back the sliding shaft, and the weights now acting, one of them, hanging upon a strap which passes over a roller placed upon the back side of the fountain, draws the carriages with the shaft and fly wheels forward, and falling on the board fixed upon the lever placed across the lower part of the frame, bears down the lever and moves the fountain rollers; while the other weight, giving motion to the fly wheels, the elastic or composition roller, is made to pass twice over the form upon the press; by which time the strap that trips the catch which keeps the sliding shaft forward, having wound up, the stop at its end, trips the catch, and the weight continuing to descend, the straps extending from the sliding shaft to the arbor, having in the mean time been wound upon the shaft by its revolutions, so as to be drawn tight, the shaft is drawn back to its former position; bearing, in its return, upon the tail of the inking roller, which is raised from the fountain roller to the large distributing roller, and communicates to it a portion of ink. The operation may now be repeated.

The parts of this machine which I claim as my improvements and invention, besides its application to printing presses, other than "Neal's vertical printing press," are: the fixture for moving the catch which holds back the sliding shaft; that for moving the ratchet barrel upon the arbor, together with the rachet barrel; that for moving the fountain roller; the sliding rods and carriages; the longitudinal pieces at the ends of the frame, which give the arms of the roller a horizontal motion; the slot or range of holes in one spoke of each wheel, by which the roller may be made to traverse a greater or less space; the placing of the scraper of the fountain roller on the front side of the fountain by which ink may be more conveniently put into the fountain; and, the fixture for raising the inking roller from the fountain roller to the large distributing roller.

The advantages which the apparatus with my improvements possesses over Neal's apparatus, are: that, requiring much less weight, the apparatus is worked with proportionably less power; that, as the roller may be made to traverse a greater or less space, the apparatus may be adapted to forms of different magnitude, and, that the machine may be applied to printing presses in common use.

RICHARD WOOD.

Specification of a patent for improvements on a mode of "Building Boats and Sea Vessels," patented on the 12th day of September, 1816. Granted to WILLIAM ANNESLEY, *Albany, New York, November* 6, 1830.

To all whom it may concern, be it known, that I, William Annesley, of the city of Albany, in the state of New York, did, on the twelfth day of September, in the year one thousand eight hundred and sixteen, obtain letters patent of the United States, for a mode "of building boats and sea vessels, without the ordinary timbers, excepting stem, stern posts, transom, gangway beams, and knees, by three or more courses of planking, on moulds, with tarred paper between each course." And that after many experiments, I have succeeded in making several improvements in my said mode of building vessels of all kinds, whether intended for river, or sea service, and that the following is a full and exact description of my said improvements, and of the manner in which the same are practically employed.

My former practice was to set up stem, stern post, and transom, with a fore and aft mould, outside from transom to stern, to give the fore and aft rake, and without kelson. My improvement in this part consists in laying a kelson, with the first fore and aft plank firmly attached to it, and projecting an inch, more or less, on which my vertical moulds rest, and using the interior fore and aft mould attached to the kelson.

My improved method of planking is effected as follows. My first fore and aft plank being parallel, and fastened to the kelson, I tack my spiling lath to the moulds, its edge bearing on the centre plank for a few feet, as a guide, and passing it up without bias, to the bow deck clamp, (or harping,) where it strikes, gives the curve of the centre fore and aft plank; the spiling being taken from the centre of the fore and aft mould to the inner edge of the lath, and transferred to the plank, having a centre line struck, and the spiling set off on each side, gives the lines of the first fore and aft plank, where the vessel is an equal figure from the centre. Thus, by having the planks parallel in the waist, a straight edge will lie along every seam when planked; being without stealers, or irregular figures, and one spiling will exactly fit all round, having the strike of equal width where the figure is equal. If not, it will require one spiling forward, and one aft, for every strake. The greatest possible strength is thus preserved in the planking, as the fibre of the wood is unbroken on the straight side. This may be perfectly understood by reference to the accompanying drawings.

When the first course is completed, it is payed over with a coat of pitch and oil, lime and tar, or some similar composition; and over this are placed sheets of tarred, or oiled, paper, as is likewise done between every course of planking; the process in this last particular being the same as in my former method of proceeding, is not claimed as making any part of my improvements.

A transverse course of planking is next to be laid on, from gunwale to gunwale, as far as the waist extends, to the rise fore and aft, it may be laid on in parallel straight plank, but where it begins to rise, spaces should be left equal to the breadth of the plank designed for use, to allow the plank free liberty to incline to the centre, and lie flat. The spaces are afterwards to be filled up by tacking a narrow thin lath in the centre of the space, and marking the distance between the edges of the plank, and transferring them to a plank having a centre line struck lengthwise and athwart, correctly, where the lath and centre of the bottom of the vessel correspond.

In vessels having an odd number of courses, as 3, 5, or 7, I place them alternately fore and aft, and athwart. For small boats, in two courses, I place the first outside, on the moulds, and bend in between the moulds the second, and remove the moulds as they interfere. When the moulds are removed the inner layer of planking is caulked, or wedged, and the outside may be caulked in the usual manner. But instead of caulking I have invented a mode of wedging, which I greatly prefer, and which I deem a very important improvement. The wedges which I use, are made of wood, and are a little longer than the thickness of the plank to be wedged, in order that the edges may bend, and thus key, when they come in contact with the planking beneath that to be wedged. The wedges, before they are driven, are dipped into white lead paint, which forms a perfect water proof cement.

In order to give a practical idea of my mode of procedure, I present the following account and description of the building of the De Witt Clinton steam vessel, at Ithaca, on Cayuga lake, in the state of New York. This vessel having been recently built, will serve to exemplify the improvements on my former patent, for which I now claim an exclusive right.

This vessel is 100 feet long on deck, her extreme breadth 18 feet 6 inches, her depth of hold 8 feet 10½ inches, and consists of four courses, as follows. First course, 1⅛ inch thick, white oak plank. The second and third courses are each ¾ inch thick, placed transversely, in succession. The fourth, or outside course, is 1¼ inch in thickness, making altogether a thickness of 3⅞ inches. The kelson, 65 feet in length, is of pine, 12 by 9 inches; with a centre plank 11 inches wide; it was laid on four uprights, sunk two feet, and rising three feet six inches above ground, and well braced. On each upright was placed 4 wedges, in two courses, all levelled fore and aft, and athwart; one pair to be driven out to permit the transverse planking to pass under, and then to be replaced to relieve the others. Her kelson was laid level, it being necessary to launch her broadside. Her fore and aft and vertical moulds being set up, the deck clamps, of two inch oak plank, 10 inches wide, in two courses, were fastened to the moulds by small iron clamps and screws, all being well braced. The perfect accuracy with which vessels can be built upon this plan, was evinced by the laying on of the first course of plank without the slightest alteration being required in the moulds.

The first course was laid with 20d. cut nails, and hutchocks, or

wood stops, to permit them to be drawn; it was then thoroughly coated with pitch and oil. The second course of plank was bent round transversely, from gunwale to gunwale; the plank used was ¾ inch thick, and was fastened with 6d. cut nails; the wood stops being split off, and the nails of the former course drawn, as they interfered. A layer, or coat, of pitch and oil, was applied as before, and upon this one of oiled paper. The third course of ¾ inch oak plank, was laid in the same manner as the last, observing to break joints therewith. The fourth and last course of planking, which was 1¼ inch thick, was fastened with cut nails, 4 inches in length, and having square heads. The nails were prepared by heating them to redness, carefully, and equally, and plunging them in that state into fish oil; a film is thus spread over them which forms an impervious varnish, protecting them against rust for an indefinite length of time.

In laying this last course, after the centre fore and aft plank was first secured, its edges were then covered with a coat of stiff white lead paint, and every succeeding plank was treated in the same way; the whole outside seams being painted when the planking was finished; the moulds being then removed, the inside was caulked in the usual way.

The next operation was the wedging of the outside, to which I have already referred. The wedges were made of poplar, (or white wood,) and cut by tools made for the purpose, by which they were all cut to the same size. Those used were 4½ inches wide, 1½ inch long, 3-10 thick at the back, and 1-10 at the edge. The seams were opened in the usual manner, the points of the wedges dipped in stiff white lead paint, and driven nearly flush. When planed off, the whole surface exhibited an appearance of peculiar neatness, and of the most perfect solidity.

Two engine sills of 60 feet in length, 12 by 10 inches, were placed on each side of the kelson, at a foot apart; they were screw bolted through the bottom; there being bridging pieces of 2 inch pine plank, at 2 feet apart.

The bulk heads, four in number, were formed of two courses of inch pine plank, one course being upright, and the other horizontal. Their distance was such as to allow 65 feet for the length of the main cabin floor. This floor was also laid in two courses, the first athwart, and the second fore and aft. It was of 1¼ pine plank.

The stem, or cutwater, was now bolted on, leaving a rebate to receive the first fore and aft planking of the gripe. The stern also was cut through, to receive the stern post, which measured 14 by 10 inches, and rebated to receive the fore and aft planking of the dead wood, astern.

There are five beams athwart this vessel, three of which serve to support the boilers, which are carried on the wings.

In sailing vessels I use no beams, or carlines, but place two additional plank athwart, at the openings, to receive the comeings of hatchways, cabin, &c.

The decks of the De Witt Clinton were formed on the same prin-

ciple with the body, being in three courses. Fore and aft pieces were fixed temporarily to give the curve to the deck. The upper course of planking was wedged, in the way before described.

When this vessel was completed, the vibration occasioned by the working of the engine, was scarcely perceptible. She was so tight, as to render it necessary to pump water into her to sweeten her; and three inches of water being kept in her, was, by absorption and evaporation, reduced to two, in 36 hours.

In large vessels for sea, I now form my moulds from a model, (cut into sections) of a figure to permit my cross planking to pass entirely round the waist, as far as the harpings, fore and aft. Thus forming, internally, an eliptic barrel, between the forward and aft bulk heads. To give the outside form, I place brackets at proper distances, and I continue the outside planking up. I sometimes form solid water ways of pine wood, in two or more courses, into which I mortise for my stanchions, plank up with oak, and place an oak plank for a cap, and to project, forming a moulding entirely round the gunwale.

Having thus given a description of my present mode of procedure in forming the hull of the vessel, I will now detail those particular improvements which I have made upon the methods used by me when my first patent was obtained; referring for a more perfect understanding thereof, to the drawings which accompany this specification, and to the explanatory references made thereto. I have also deposited a model in the patent office, built upon a scale of $\frac{1}{4}$ inch to the foot.

In my former plan, a stern post and transom were set up. This mode is now rejected. In my improved mode I lay the kelson, with the first fore and aft plank laid on it, and projecting on each side an inch, more or less, on which the upright moulds rest. This I claim as new.

I now lay permanent deck clamps, in two or more courses, which are continued all round on the moulds, and attached to them by small iron clamps, and wood screws, to be drawn when the moulds are removed. I also lay my first course fore and aft with hutchocks, (or wood stops.) These methods I also claim as new.

The continuing the planking entirely round the waist, into the fore and aft deck clamps, and placing brackets, or water ways to form the outside, as above described, I claim as new.

I claim likewise my present method of planking in the fore and aft courses, whereby each plank has one straight edge, in consequence of which a flexible lath, the edge of which is straight, will lie to every seam. I claim also my manner of taking the spiling of the transverse courses, as explained in the account of the De Witt Clinton.

Instead of my former manner of setting up the stern post, the inserting of it through the body of the vessel above the deep water line; and the fitting my stem after the body is planked, caulked, or wedged; and the building my keel, where great length and depth are required, in courses, and gripe, and dead wood, as before described, and shown in my drawings, are claimed by me as new.

I likewise claim the substitution of wedging for the ordinary mode of caulking, in the manner and for the purposes herein described.

The method of laying the deck for open vessels, (that is, those not continued round entire in the transverse courses,) I claim as new. This consists in employing three or more courses, the first two laid athwart, and the upper course fore and aft, upon the principles and in the manner hereinbefore set forth.

WILLIAM ANNESLEY.

Abstract of the specification of a patent for a new mode of uniting Timber together, so as to combine great strength, compactness, and durability; which is applicable to many purposes in the business of civil architecture and engineering, such as the building of Bridges, Aqueducts, Domes, and many other structures. Granted to WILLIAM ANNESLEY, *Albany, New York, November* 6, 1830.

To all whom it may concern, be it known, that I, William Annesley, of the city of Albany, in the state of New York, have invented a new mode of uniting timber together, so as to combine great strength, compactness, and durability. This invention is applicable to many purposes in civil architecture and engineering, such as the building of bridges, aqueducts, domes, and many other structures. The general principle upon which I proceed being the same as that which is detailed in a specification or description of my mode of "building boats, and sea vessels;" for which I have applied to obtain letters patent of the United States, in an instrument of writing bearing date with the present.

And I do hereby declare that the following is a full and exact description of my said invention, and of the manner in which it may be carried into effect.

For the purpose of exemplification I have chosen a "groined arch bridge," an "aqueduct," and a "dome;" not, however, intending to restrict myself to these in the application of my invention, the essential feature of which is the forming of the structure, whatever it may be, by uniting together two, three, or more thicknesses, or layers, of plank or boards, some of which layers cross the others transversely; the whole being bent, or formed upon moulds, and closely united together, so as to be impervious to water, and to retain the shape given to them, after the mould by which it has been determined, is removed.

For a bridge, abutments are to be built in the usual way, and sills of the most durable timber being placed three or four feet from the faces of the abutments, are levelled to the curve of the arch, and firmly built in with stone and mortar. Uprights of suitable lengths, and at convenient distances apart, are fixed in the bed of the river, and properly braced, they rising to the height necessary for supporting the intended arch. The curve of the arch having been marked

on these uprights, they are to be cut off fair to these marks. The first course of outside string pieces, are then laid, and fastened to the tops of the uprights by iron clamps and wood screws, which are afterwards to be drawn. This first course may be 10 or 12 inches in width, and four in thickness. A second plank course, of the same dimensions, is then laid on, breaking joints with the first. The arched transverse beams are then fixed in their places, and filled in between in two courses, as shown by the dotted lines; the upper one being trimmed to the transverse curve. These are all to be fastened together with oak pins. The first course of the centre string is now laid on and pinned to the beams, and the second laid flush with the beam and pinned. On these I commence laying my first course of groin arch, of two inch pine, using the longest plank which I can obtain. They are all made truly to a width, and bevilled to fit the transverse curve, and fastened to the beams with long cut nails. The next course of plank is laid athwart, pine $1\frac{1}{4}$ inch in thickness will answer. The third course may be 2 inches in thickness; a fourth transverse course, similar to the second, is then laid, and this is followed by the fifth, or last course. In laying this upper course longitudinally, the jointed edges of the plank should be coated with good white lead paint. The seams are afterwards to be wedged, in the manner described in the specification of my mode of "building boats and sea vessels." The last plank being 2 inches, the wedges should be $2\frac{1}{4}$ inches long, 3-10 thick at the back, and 1-10 at the edge; those which I have used were $4\frac{1}{2}$ inches wide, and were made of poplar, (white wood.) The seams are to be opened, as for caulking, the wedges dipped in white lead paint, and driven home, so as to clinch upon the transverse timber below.

The cut nails used may be preserved from rust by heating them red hot, and plunging them in fish oil; and between each course of planking, the whole surface should be payed over with pitch and oil, or some similar article; oiled paper also should be interposed throughout, between every layer, or course, of plank.

My plan of uniting timber may be applied to aqueducts, either open or close. When it is desired to erect an aqueduct at once in its proper place, a scaffolding must be raised to support it, as in bridge building. Aqueducts may also be built in sections, and these afterwards elevated, and united together.

The mode of procedure being generally the same with that followed in the building of bridges, I deem it unnecessary again to go into details.

What I claim as new, is, the uniting together of layers of wood in longitudinal and transverse courses, in the manner herein described, either in the building of bridges, aqueducts, or other structures; and generally the application of the same principle which I have adopted in the building of boats and sea vessels, to the erection of structures on land.

WILLIAM ANNESLEY.

Remarks by the Editor.—The space occupied by the foregoing specifications forbids our making any extended remarks upon the

merits of Mr. Annesley's plans. We know, however, that he has devoted many years of his life, and expended large sums of money, in bringing them to their present improved state. In the building of vessels in particular, to which he has principally devoted his attention he has necessarily, at every step, had to encounter the self-interest, and the honest prejudices of the ship builders. His method is, as regards their business, a revolutionary measure, and should it eventually supersede the long established method of building vessels, it is not likely that he will ever reap the reward of his labours. Innovations of the description proposed, are rarely accomplished in a single generation.

That his plan of uniting timber will insure to his structures a greater degree of strength than can be obtained from the same weight of material, combined in any other way, we have no doubt. The strongest objection which presented itself when the plan was new to us, arose from an apprehension that the infiltration of water between the layers, would produce early decay. We, however, are assured, that after the experience of many years, no such effect has been produced.

Whether his mode of building may be as advantageously applied to the construction of the larger class of ships as to vessels of a smaller size, may admit of doubt: that those of considerable burthen may be so built, and that they will be strong and durable, has been abundantly proved, although constructed in a way much less perfect than that now adopted. We understand that Mr. Annesley is likely to have an early opportunity of building a government vessel upon his principles.

We have given but a small portion of the second specification, as our only object was to present the main features of the invention. The skilful mechanician will have no difficulty in perceiving how it may be applied to domes, aqueducts, and other structures.

Specification of a patent for a Labour-saving Tanning Apparatus. Granted to WILLIAM BROWN. *City of New York, November* 11, 1830.

THE improvement herein claimed by the subscriber, is the connecting and concentrating of the various processes through which the hides pass before they become leather, by means of suitable machinery, into one apparatus, the construction of which is as follows.

There are four, or more, leatches, or cisterns, for infusing the bark, which are placed contiguous to the handlers, or vats, on the same level, but projecting at the top above them. These leatches, or cisterns, communicate with each other by means of tubes, inserted between them near the tops, and are supplied with false bottoms, which fit loosely, and which are perforated with holes, forming a kind of strainer. In each of the leatches is fixed an aqueduct or tube, which is used to convey the liquor from the bottom to the communicating tubes. By this contrivance the liquor is passed

from the bottom of one leatch, into the top of the adjoining one, where it acquires a fresh portion of strength, and is thus propelled through the whole series, by pouring the water or weak liquor into the tops of the leatches, until it being of sufficient strength, arrives at the fourth or strongest leatch. There is also placed in one corner of each of these leatches, what is called an eye, which consists of a trunk projecting below the bottom of the leatch, and connected to a horizontal pipe, which serves to convey the liquor, when of sufficient strength, directly to the handlers, or vats; this trunk is supplied with a plug for regulating the quantity of liquor thus drawn off.

At a convenient distance from the leatches, and on the same level with them, is placed a heater, which consists of two or more horizontal copper, or iron, pipes, which are placed one above the other, and have connecting tubes near their ends. These pipes are attached to and communicate with another, of a square form, in which the fire is made. These pipes, or heaters, are secured within a cistern, with their ends projecting at one side, and have caps for the convenience of cleaning.

It will be seen that when a fire is kindled in the lower heater or box, the heat passes from it into the tube above at its farthest extremity, and comes forward and enters the next above, and so goes backward and forward until it enters the chimney at the opposite side, thus transmitting all the heat of the fire, to the liquor with which the cistern is constantly filled. There is a tube communicating with the heating cistern for supplying it with weak liquor or water, and communicates at its opposite extremity with a trunk or reservoir, which is furnished with a pump, by which the liquor is raised to the tube and forced into the heating cistern, which is kept constantly full by this means; the heated liquor passing off at a different tube, which communicates directly with the leatches. The leatches are filled with bark by means of a conveying trough communicating with the elevators of the mill.

The strong liquor or infusion passes from the bottom of the leatches as before mentioned, into a trunk passing into a horizontal position under them, and rises by a vertical tube inserted in said trunk, from which it is transmitted to another horizontal trunk communicating with the handlers, or vats, and passing along their upper surfaces. By this method the liquor from the leatches is transmitted into the tops of the handlers, or vats. At the bottom of the vertical tube, and within the lower horizontal trunk, is placed a valve moveable by means of a strap extending up through the said tube. This valve is to prevent the stronger liquor from entering the reservoir, and thus mixing with the weaker.

The liquor after having passed through the handlers, or vats, is drawn from their tops by means of a hollow plug inserted into the lower trunk before mentioned, and runs into the trunk or cistern, from whence it is again transmitted to the heaters, and so on to the leatches; so that the same liquor is continually in use; the evaporation and waste of which is supplied by water.

In each of the handlers is a reel, or cylinder, formed by two circular heads secured at the required distance apart by longitudinal bars; and having gudgeons which work in slides, for the convenience of elevating or depressing them at pleasure. The hides are secured on the inside of the reels by means of hoops, which encircle the reels a short distance from their heads, and have pins on their outer surfaces by which the hides are fastened; or they may be thrown loose into the reels.

The great saving of labour in this invention consists in the facility with which the hides may be kept in motion when immersed in the liquor. Each of the reels has a rag wheel attached to it, and is turned one notch at a time, by means of a shaft which is geared into a click, to be worked by hand, or may be moved by animal, water, or steam power. The piston of the pump in the trunk or reservoir, is attached to one of the shafts, and may be moved or unshipped at pleasure.

There is what is called a beam house connected with this apparatus, where the hides are first limed before they are put on the reels. The water which is necessary to mix the lime, is heated and supplied on the same principle as before mentioned for the leatches; and the piston of the pump attaches in a similar manner to the shaft. In laying away hides, it is necessary to have the ground bark which is put between them, moistened or damped, to prevent waste and dust. The contrivance for this purpose consists of a small cistern, elevated at a convenient height, and supplied with a spout perforated with holes, and a cock for regulating the quantity of water required to wet the bark, which is placed under it. The subscriber claims the privilege of using his improved labour-saving tanning apparatus, on as large or small a scale as he may require, and with any number of leatches and handlers. WM. BROWN.

Specification of a patent for a new and useful method of supplying the Boilers of Steam Engines with Water. Granted to JOHN S. WILLIAMS, *Maysville, Mason county, Kentucky, November* 17, 1830.

1. THERE must be a water chamber placed at the horizontal level, with the height the water is intended to maintain in the boiler, or boilers, intended to be supplied.

2. The water chamber must open into the supply water by a communication furnished with a valve opening toward the water chamber. The supply water must be higher than the water chamber, so as to run in of itself, or be forced in by a pump, or be drawn in by a vacuum.

3. The water chamber must open into the boiler intended to be supplied, below the height of the water it is intended to maintain in the boiler, by a communication furnished with a valve opening into, or towards the boilers.

4. The steam in the boiler above the water must open into the

water chamber above mentioned, by a communication which can be opened or shut at pleasure.

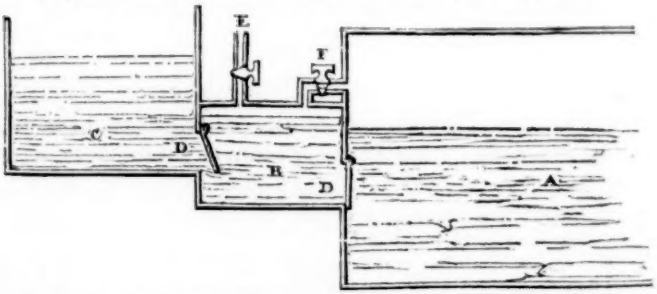
5. The water chamber must open upwards into the atmospheric air, or a vacuum, by a communication that can be opened or shut at pleasure.

It is evident from the principles of hydrostatics, that if the steam of the boiler be shut out of the water chamber, and the communication be opened upwards from the water chamber into the atmospheric air, or a vacuum, that the supply water will flow through the communication described in the second head, above, and fill the water chamber.

It is equally evident that if that communication described in the 5th head above, be then closed, and the steam in the boiler be let into the water chamber, by the communication described in the 4th head above, that the water in the water chamber will flow into the boiler through the communication described in the 3d head above, until the water in the water chamber, and that in the boiler, shall maintain one level.

It is also evident that by alternately opening and shutting the two communications described in the 4th and 5th heads above, that the water chamber will be alternately filled with supply water, and emptied into the boiler, as long as the alternate opening and shutting are continued. Hence it appears that the supply of water in the boiler will not only be kept up from without, but that it can never rise higher nor sink lower in the boiler than a line above the level of which the water chamber shall have sufficient capacity to supply the water in the boiler during one operation of alternately filling and emptying the water chamber. JOHN S. WILLIAMS.

Explanation of the drawing illustrative of the apparatus.



A, boiler. B, water chamber. C, supply water. D, D, valves. E, F, cocks. When the cock, E, is open, and F closed, the pressure in the boiler will close the valve between it and B, and the supply water will flow into the water chamber, through the valve between it and C. Shut E, and open F, and the steam from the boiler will pass into B, its pressure will close the outer, and allow the inner valve to open, when the water will flow into the boiler, and stand at the same level in it and in the water chamber.

The capacity of the water chamber above the water line, must be equal to the waste of the water in the boiler during the filling and emptying of the water chamber. And if the operation of alternately opening and shutting E and F, be kept up, the water in the boiler will never rise higher nor sink lower than the water line, while the supply water continues in C.

Specification of a patent for an improvement in the mode of combining Printing Types for Music. Granted to George Bruce, *City of New York, November 27*, 1830.

In combining printing types for music in the manner here contemplated, the lines of the staves are formed with separate rules, and the characters are cast in sections, or pieces, to occupy the spaces between the lines or rules, being cut, or divided by the rules, wherever they intersect, and forming with them perfect characters.

I claim as my invention the use of separate rules, which, in combination with suitable types adapted to the spaces, between the rules, shall form perfect characters of any required description. By this method the lines of the stave are more perfect than by the old method of casting characters and lines together; kerned types are unnecessary, the number of characters is reduced, the use of them in printing facilitated, and the cost decidedly diminished.

George Bruce.

Accompanying the foregoing specification are two specimens of printing with the types described. One of them the sections of types without the rules, which exhibits the spaces which the rules are to occupy. The other the types combined with the rules. Its appearance is neat and distinct, and we think it a real improvement on the former modes of casting types for printing music.

ENGLISH PATENTS.

To Thomas Prosser, *Architect, a patent for Certain Improvements in the construction of Window Sashes, and in the mode of hanging the same.* September 6th, 1830.

Mr. Prosser proposes in this specification to attach the upper and lower sashes, to the same lines which pass over a pulley attached to each side of the frame near the top of the window. These are of the kind usually called side pulleys, which have their axes at right angles to the surfaces to which they are attached. The small frames in which the pulleys turn, are moveable in dovetailed grooves in the window-frames, and adjustable by a screw to regulate the tension of the sash-lines. The two sashes are thus made to balance each other, entirely obviating the necessity for the metallic counterpoises usually employed to facilitate the raising and lowering of the sashes. From this description, it will be perceived that one of the sashes

cannot be moved without moving the other, so that the opening can never be made entirely either at the top or bottom of the window, but an equal portion of it will be at each.* The method of attaching the line to the sashes, consists in tying neatly to the ends of the lines small pieces of metal, with longitudinal rectangular slits, which pass over T studs, fixed into the sashes with their heads across, by which the lines are secured from being accidentally detached when once they are hooked on. Instead of the beads, which are generally fixed to the frame on each side of a window-sash, as guides to keep it in its place while stationary, and to preserve their perpendicular position while elevated or depressed, this patentee fixes a single rod into the frame, which fits accurately into a groove in the side of the sash. This constitutes a fitting less pervious to the weather than that usually adopted, at the same time that it affords great facility in cleaning the windows; for, as the guide-rod of the lower sash does not extend more than half way down, so that the lower sash being elevated to the top of the window escapes its guide-rod, and may be turned inside out, and the upper sash being lowered to the bottom, may be similarly reversed, and by this means all parts of the window can be brought within reach of a person in the room, for the purpose of cleaning or repairing.

The improvements here contemplated seem to be all good; but we consider the last mentioned will be extensively adopted, and become very useful; for the present method of cleaning the outsides of high windows is attended with much danger and inconvenience, or with much injury to the fittings by the frequent removal of the side beadings. [*Register of Arts.*

To WILLIAM *and* ANDREW RAMSAY, *and* SAMUEL ORR, *Sail Makers, for an improvement in the manufacture of Canvass and Sail Cloth, for the making of sails.* September 20th, 1830.

THE improvements contemplated by these patentees, consist in a method of making sail-cloth, or canvass, with the yarn constituting the weft in an oblique position, instead of crossing the yarn constituting the warp at right angles, according to the usual manufacture. To effect this the working parts of the loom, such as the batton frame and batton, the lames, the reed, &c. are made to shift upon the side frames to any required angle, and arranged so as to be secured by clamping or screwing, to preserve the necessary position during the weaving of any one piece of the canvass. The slits of the reed must be placed at the same angle with respect to its frame, as the frame itself makes with the side frames of the loom, that the reed may move freely between the threads constituting the warp.

* There is no novelty in the above mode of hanging sashes, as a patent was obtained for it in the United States, twelve or fourteen years since.

[EDITOR.

It will be perceived, that these modifications are equally applicable to the hand and power loom.

The advantages which canvass manufactured in this way possesses over that manufactured from yarn of the same quality, with the weft crossing the warp at right angles, is, a greater degree of strength when the principal tension or strain upon the sail, is made to coincide with the direction of the threads of the warp or weft, and this can always be done with sail-cloth manufactured as above described, for the sails are strained by application of force to the corners. This circumstance must, however, be attended to by the sail maker. [*Ib.*

To SAMUEL ROBERTS, *Silver Plater, for certain improvements in Plating or Coating of Copper or Brass, or mixtures of the same, with other metals or materials, or with two metals or substances upon each other; as also a method of making such kinds of articles or utensils, with the said metal when so plated as have hitherto been made either entirely of silver, or of copper or brass, or of a mixture of copper and brass, plated or coated with silver solely.* September 20th, 1830.

THE improvements invented by this patentee, consist in introducing a layer of white metal, as that mixture of zinc, nickel, and copper, denominated "*German Silver*," between the metal to be plated, and the silver with which it is plated. The advantage of this invention is, that when the silver wears off in parts, the defects are not readily perceived, as the under metal is very nearly of the same colour. The German silver is to be applied by a process precisely similar to that usually adopted in plating, and the real silver is then to be applied to the compound metal, which is to be moulded into form either before or after the process of plating, as circumstances may require. [*Ib.*

To WILLIAM AITKIN, *Esq. for certain improvements in the means of keeping or preserving Beer, Ale, and other Fermented Liquors.* September 24th, 1830.

IT has been long the practice to keep the fermented liquors either in casks or glass bottles, closely stopped, to prevent the escape of the carbonic acid gas, by which liquors would become flat. The preference being given to the plan of keeping it in small bottles, as far as regards the quality of the ale, beer, &c. for this enables the consumer to prevent any being exposed to the atmosphere, except the quantity which he may require for use at any one time. But this plan has been found too expensive for general introduction.

Now to unite the advantages of the bottles, with the economy of

the barrels, is the object of Mr. Aitkin's patent, and he proposes several methods of carrying the object into effect; in all of which he preserves the liquor under pressure, to prevent the escape of the carbonic gas. One plan is to make the barrel cylindrical, with an air-tight piston moveable within it; that it may be forced down upon the surface of the beer, by a screw or otherwise, whenever a quantity is abstracted for use. Another method is to introduce within the cask, which may be made of the usual form, a kind of elastic bag or vessel, of sufficient capacity to fill the cask. This bag must be made of materials impervious to air and moisture; and as the beer is withdrawn, the bag is expanded to occupy the place, by injecting air or water: and thus an uniform pressure is preserved upon the beer as long as any remains in the cask. [*Ib.*

To RICHARD IBOTSON, *Paper Manufacturer, for an improvement or improvements in the method or apparatus for Separating the Knots from Proper Stuff or Pulp, used in the manufacture of paper.* November 29th, 1830.

HITHERTO much difficulty has been experienced in clearing the stuff or pulp of which paper is made, of the small knots, which are invariably found in it, and which, if not separated, necessarily diminish the quality of the paper. The sieves or strainers which have been generally employed for separating the knots, have been either so wide in the meshes as to permit the smaller knots to pass through, or else they very soon get clogged up, for it is evident that the fibres of which even the finest paper is made, are considerably longer than one of the meshes in the sieve, and hence they will, instead of passing through, be deposited across the meshes, and immediately render the sieve useless.

To remedy these imperfections, Mr. Ibotson manufactures his sieves or strainers, which he applies to the paper machines distinguished by the term Fourdrinier's machines, of metallic bars, giving the preference to gun-metal, made flat on the upper surface, and about half an inch wide, or at all events of a width greater than the length of any of the fibres in the pulp. The bars are strengthened, by a projection extending along the middle of their lower sides, so that the cross section of one of the bars may be represented by the letter T. These bars are in a frame at a distance from each other, corresponding with the intended quality of the paper for which the sieve is to be used. He has designed, however, a very ingenious method of adjusting the distances between the bars, so as to make the sieve answer for the manufacture of paper of different qualities. For this purpose he makes all the bars to taper uniformly, and fixes every alternate bar with its narrow end towards the same side of the sieve; and he frames the other bars together, but does not fix them to the sieve; they are introduced between the fixed bars with their narrow ends in a contrary direction. By this arrangement it is evident that the distances between may be diminished or increased to any

degree of nicety, with the greatest facility, by pushing the frame of loose bars forwards or backwards, which is effected by means of adjusting screws. The sieve is to be placed in a trough conveniently situated, to receive the pulp from the hog or machine by which the rags are torn to pieces, and agitated into the consistence of pulp. One side of the sieve, which is made of the form of a rectangular parallelogram, is attached by hinges to the trough, and the other is connected with a set of cam-wheels, by which it is elevated and depressed with great rapidity; and when the sieve gets clogged up by the knots which it separates from the pulp, its surface is to be cleaned by a rake or brush, made of hard bristles. This seems to be a highly ingenious invention, and in the hands of a practical man as it is, it cannot fail to become useful to the public. [*Ib.*

To James Holmes Bass, *Gentleman, for certain improvements in machinery for Cutting Corks and Bungs.* December 3d, 1830.

Mr. Bass having prepared the cork by cutting the sheets into blocks, of the length of the required cork, and of a width corresponding with the thickness of the sheet from which they are taken, fixes the blocks successively between two chucks, in a kind of lathe, by which a slow rotary motion is communicated to them, while a frame knife is brought in contact with the circumference of the intended cork; the plane of the blade being made to coincide with a tangent to the curve. To give to the cork the requisite degree of tapering, the knife is made to approach nearer to the axis of motion at one end than the other. To the knife frame, which is supported on cams of different sizes, which are to be brought into action according to the size of the cork or bung to be cut, a sawing or slicing action is communicated by cranks and connecting rods, from the main shaft of the apparatus. As a great portion of the sheet of cork imported into this country is too thin to be cut into circular corks, of the required size for common bottles, it has been the practice of cork cutters, to make their corks somewhat elliptical, in order to save material; finding that the compression of the cork in one direction will expand it in another, and make it form, though of an elliptical shape, a perfect stopper to a circular opening. To accommodate his machine to this economical mode of cutting, Mr. Bass makes his cams which support the knife frame, of an elliptical form; and as the rotation of the cams are made to coincide with the rotation of the cork holders, the corks will be cut of an elliptical form, as if they had been manufactured by hand.

The principle and arrangements of this machine are highly creditable to the ingenuity and judgment of the patentee, who will doubtless reap the benefit of his labours. [*Ib.*

To JOHN WILKS, *Engineer, Millwright, and Machinist, one of the copartners in the firm of* BRYAN, DONKIN, & Co. *Engineers, Millwrights, and Machinists, for an improvement or improvements in a part or parts of the apparatus for making Paper by Machinery.* October 24, 1830.

THE improvement contemplated by this patentee, is, the application of an additional roller to the machines used in the manufacture of paper, and known by the name of Fourdrinier's paper machines. The additional roller is to be perforated, and it is intended to facilitate the escape of the water from the pulp web, previously to its being subjected to the pressing rollers. Still more to facilitate the abstraction of the water, Mr. Wilks proposes to employ the pressure of the atmosphere, by making a vacuum within that part of the perforated roller on which the paper web rests.

The method of making these rollers is described to consist of the following processes. A piece of sheet copper, brass, or other suitable metal, is bent and soldered in the form of a tube, whose length is equal to the circumference of the intended roller, and whose circumference is equal to the length of the intended roller, making an allowance for the waste at the ends. The tube is then to be drawn on trebletts, in the usual manner, and afterwards turned truly cylindrical on the mandril on which it was drawn. A series of grooves, eight or ten in number, are then turned half through the tube, with a tool the sixteenth of an inch wide, and so made as to make the bottoms of the grooves as wide as their tops. The tube is then taken from the mandril, cut open, and bent inside out and soldered in the form of another tube, whose length shall correspond to the circumference of the first, thus constituting a hollow cylinder with longitudinal grooves inside. It is to be again drawn and turned with grooves to the amount of twenty-four in the inch, these will of course cross the other at right angles, and being cut half through as before, the entire surface will be composed of transverse ridges and rectangular perforations.

When it is desired to employ the exhausting principle, a second perforated cylinder is introduced with the first. The inner cylinder must be made smooth inside, that it may fit air tight upon a sectoral cavity extending from the axes to the circumference, enclosing about an eighth part thereof, opposite to the place covered by the web of paper as it passes over the roller. The air is pumped from this cavity through the axis, which is made hollow for that purpose, by an air pump of the usual construction. When this method of abstracting the water is employed, the roller must be put in motion by a train of wheel work, so arranged that it may coincide precisely with the motion through the machine. [*Ib.*

To GEORGE HARRIS, *Captain in the Royal Navy, for improvements in the manufacture of Ropes and Cordage, Canvass, and other fabrics or articles, from substances hitherto unused for that purpose.* Enrolled March, 1830.

THE object of this invention is to produce a rope, or sail cloth, which shall be impervious to water.

The patentee proposes to employ as the substance of his improved ropes or cordage, a vegetable production, called *silk grass*, which, when dried, is to be beaten and heckled in the same manner that flax or hemp is usually prepared. In the process of preparing the grass, it is proposed to introduce a bituminous and gummy material, which is intended to saturate the fibres of the grass, for the purpose of preserving the ropes, cordage, or sail cloth, or any other fabric made from it, when exposed to the effects of damp.

This gummy material is to be compounded of the milk of a tree called the *ficus indica*, with *aspultum*, or *bitumen judaicum*, and *cocoa nut oil*. The proportions are to about twenty-five gallons of the milk, one gallon of the oil, and from one to twenty gallons of the bitumen, according to circumstances.

These substances when properly combined, which may be done over a slow fire, constitute a gummy material, into which the fibres of the grass may be dipped while heckling, and it also may be applied in twisting or spinning. It is likewise proposed that the workmen in twisting the strands of cord, shall dip their hands in the material, and work it well into the fibres and texture of the rope.

When this gummy material has become dry, it will resist water, and prevent the rotting effects of damp upon the fibres of the rope, cordage, sail cloth, or other articles manufactured from it.

[*Lond. Journ.*

To WILLIAM FAWCETT, *Engineer, and* MATTHEW CLARK, *Engineer, for their invention of an improved apparatus for the better Crystallization of Sugar from the Canes.* Enrolled June, 1828.

THE leading feature of this invention is the application of high pressure steam to the external surfaces of sugar pans or vessels in which the cane juice is boiled, for the purpose of concentrating its crystals, that is, evaporating the aqueous parts from the sugar.

Any peculiar form or disposition of the vessels does not appear to be essential; but such an arrangement must be adopted, as will allow of the steam from a high pressure boiler to be brought in contact with, or surround, the several pans in which the molasses, or cane juice, is placed for evaporation.

It is proposed to construct a very strong steam boiler of wrought or cast iron, having the furnace and flues within surrounded by the water, so that little or no heat may be lost by radiation. This boiler is to be proved to bear the resistance of steam at a pressure

considerably greater than it will ever be required to be employed, and safety valves are to be placed in suitable situations, to prevent explosion. On the top of this boiler the sugar pans are to be mounted, with jackets surrounding their lower surfaces, connected by flanches packed steam tight. From the boiler, pipes are to be laid, for the purpose of conducting the high pressure steam into the spaces between the pans and their jackets, the heat of which will cause the molasses, or cane juice, in the pans, to boil, without subjecting it to burning, or baking on to the internal surface of the pan.

The pans may be connected in any other way with a generator of high pressure steam, which steam may be conducted under the pans by pipes or other means, and the steam boiler or generator may be employed at the same time to drive the engine, or other machinery connected with the sugar works.

The ends of the flues in the boiler are to discharge themselves into other flues leading to the chimney, but they must be furnished with dampers, to prevent the heat from passing away too freely; and additional pans may be placed in connexion with the chimney or flues, by which the heat of the vapour and smoke may assist in preparing the liquor for the crystallizing process. [*Ib.*

To HENRY ROPER, *Esq. a Rear Admiral in our Royal Navy, for his having invented a new and improved system of Signals; first, for communicating by day, by the means of flags and pendants between ships at sea, or other objects far distant from each other; in which system the colours of the flags and pendants which have heretofore served to distinguish the signals one from another, and which by distance or other causes are extremely subject to be mistaken, may be dispensed with altogether; and, secondly, for communicating by night, between ships at sea and other objects far distant from each other, by the means of lights; and which system of signals is more conspicuous, expeditious, and certain, than any which has hitherto been employed for the like purpose.* Enrolled August, 1827.

THE features of this invention are almost as fully described in the above title as in the specification itself. The object of the patentee does not appear to be that of altering altogether the system by which signals or telegraphic communications are made from one ship to another at sea, but to simplify the process, by forming the subjects intended to be communicated into classes, and adapting to each class of subjects, peculiar signals at the onset, leading to the kind of correspondence intended to be carried on. By so doing the number of signals, consisting of flags and pendants, are reduced from forty-eight, the ordinary complement, to only twenty-two, and of course are less expensive, more easily worked, and not so liable to mistake as when a greater number are employed.

These signals are intended to represent numerals, and by being

placed at different elevations, point out whether units, tens, hundreds, or thousands; and the number thus shown, referring to a signal book, indicates by the corresponding number in the book, the word or sentence designed to be expressed.

The device upon the flag or pendant is sometimes to be the signal, at other times the colour of the flag or pendant is to be the significant mark, and at night time lanterns, with coloured glass of divers shapes, are to be employed instead of flags.

In conjunction with these, balls and other marks are to be occasionally employed; but as the specification does not point out the modes of working them, (which indeed depends upon the previous arrangement of the sentences, word, or syllable, in the signal book,) it would be useless for us to extend our description of the patentee's views further. [*Ib.*

On SHALDER'S *patent Fountain Pump.*

[To the Editors of the London Journal of Arts and Sciences.]

GENTLEMEN,—Of all machinery adapted to the general uses of life, none is so universal, and none more important than that which is constructed for the purpose of raising water from one situation to another. It therefore follows that any improvement by which this object may be effected with greater facility, convenience and despatch, becomes of the highest value to the world, and as far as regards mechanical invention, is of greater consequence in this than in any other species of machinery.

To prove this assertion, it would only be necessary to point out the numerous attempts which have been made to accomplish this desirable end. It has been the research of learned and scientific men; but many centuries have elapsed, and we have still found the same mode handed down to us, with all its acknowledged imperfections. In the invention which I am about to introduce to the reader's notice, every former deficiency is remedied, and the object required is produced by the most direct and satisfactory means, leaving no desideratum; and there is no doubt, from the strong testimonials of its efficacy, that in the course of a short time this invention will wholly supersede every other method at present in use.

When the principle of this fountain pump is thoroughly understood, its advantages are sufficiently obvious, and to those who do not comprehend its construction, or are at a loss to perceive its peculiar mode of action, I need only refer to the numerous demonstrations of its superiority. These facts decide at once in its favour.

I am now only speaking of its comparative working properties, and increased power in raising water; but when to these it is added that the fountain pump is more durable, more economical, and more simple in its construction, there can be no hesitation in yielding to it the most decided preference, whether applied to the arts, navigation, or domestic purposes.

In the common pump, when properly made, the piston should fit

the inside of the working barrel so closely as to form a perfect vacuum, that the leather or packing may press hard against the sides of the cylinder; this consequently produces, when the pump is in action, an irregular, unsteady resistance, while independently of the unnecessary waste of power to counteract friction, produces an uneasy stiffness in motion, which soon wearies the performer. By the advantages possessed in the invention under consideration, no friction occurs, and these defects are wholly obviated.

With the common pump, solid substances, as hard pieces of wood, particles of sand, &c. &c. are very apt to insinuate themselves between the bucket and the barrel; these may either unpack the piston, or by grinding and tearing the leather, or forming grooves in the barrel, render it totally unserviceable, until it again passes through the hands of the maker. In this improvement the connecter is so constructed as to cast up and deliver solid substances with as great facility as it does the fluid, and without the possibility of injury or derangement to the workmanship.

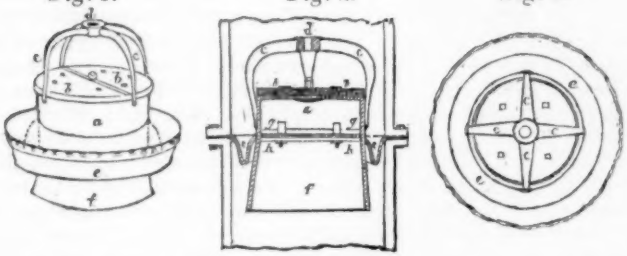
In the pump constructed upon the new principle, the bucket is surrounded by a strong pliable leather tube, which I call the connecter, of a conical figure, or the diameter of one end is rather less than that of the other; this is supported by the expresser or bucket when in movement, and easily admits of being inverted and retroverted. Its lesser circumference is closely secured to the upper and outer extremity of the expresser; and the larger circumference is fastened to the inner part of the cylinder between two flanches. This effectually precludes the possibility of leakage, as the connexion is completely cut off between the upper and lower portion of the barrel, except through the valve of the bucket. Thus we have the three grand defects of the common pump, from friction, choking, and leakage, entirely remedied; besides, as before stated, less original expense, less wear and tear, and greater simplicity.

The operation of the pump on the improved plan may be compared to the action of lifting through the air a bucket of water, suspended to the counter end of a lever, or pump handle. Supposing the bucket at each depression of the handle to empty itself, and to refill at each elevation, we have a representation of its mode of action, there being neither more nor less friction in resistance in the one instance than the other. There is only the weight of the water to contend with, and so ample is the power gained by the adaptation of the new principle, that double the work may be accomplished in a given time; in other words, that one man may perform the work of two; or what would occupy a man two days to complete, may be finished in one day.

The following is a description of this invention given by a scientific gentleman of acknowledged talent:—"This improvement is designed to avoid the friction of an ordinary pump, by substituting in place of the usual air and water tight packing of the piston or bucket, a flexible tube or diaphragm surrounding the bucket, which rises and falls with it. Fig. 1, represents the bucket with its diaphragm and other appendages detached from the pump and shown in perspective.

Fig. 2, is a geometrical section of the same taken through the middle perpendicularly; and Fig. 3, is a plan or horizontal view of the same, as it would appear when seen from above. In all which figures similar letters refer to corresponding parts; *a*, *a*, is the bucket or piston of the pump, having two valves, *b*, *b*, opening upwards as usual; *c*, *c*, are bent arms, for the purpose of attaching the bucket to the pump rod at *d*, by which the bucket is to be raised and lowered in the pump barrel, by means of the pump handle, or by any other common contrivance.

Fig. 1. *Fig.* 2. *Fig.* 3.



"The diaphragm, *e*, *e*, is a tube of leather or other suitable flexible material, which is air and water tight. It is made from a disk of leather, rather larger in diameter than the interior of the pump barrel, in the centre of which a circular hole is to be cut, rather smaller than the interior of the bucket, which gives it the form of a broad ring; this ring of leather is then soaked and pressed upon a block until it is brought into the form of a frustrum of a cone, very much resembling in shape a round hat, with the centre of the crown removed; the frustrum having a narrow rim at bottom on the outside, and a similar rim at top on the inside, which two rims are for the purpose of attaching the diaphragm to the pump barrel, and to the bucket.

"To the lower part of the bucket a cylindrical or bell formed tube, *f*, is attached, for the purpose of preventing the diaphragm from collapsing under the bucket when the pump is in action. At the lower part of the bucket there is an internal flanch, *g*, *g*, and a corresponding flanch, *h*, *h*, at the upper part of the bell formed tube, which two flanches take hold and confine the inner rim of the diaphragm, and are held together by screws, bolts, and nuts, as seen in Fig. 2. The outer rim of the diaphragm is in a similar way held securely between flanches in the pump barrel, and by these means the upper and lower parts of the pump barrel are separated, and an air and water tight partition formed, without packing the bucket as in ordinary pumps.

"It will now be seen that on the ascent or descent of the bucket, the diaphragm being flexible, will readily rise and fall, leaving the water way clear, and effecting all the purposes of a tight bucket or piston, without producing any of the friction which results from the employment of a bucket fitted closely to the barrel, as in pumps of the usual construction."

Experiments have been frequently made with this improved pump, by introducing sand, fragments of wood, gravel, apples, &c. &c., yet any substance capable of passing the valves has been ejected along with the water, without the least impediment or detriment. There is likewise a large body of evidence from practical manufacturers, who have made use of the fountain pump for different purposes, for various periods, from one to four years; these distinctly assert its manifest superiority, and amply confirm the character just given of it.

The patent pump is confidently recommended to engineers, as being the most efficient machine to remove or supply large bodies of water. By the aid of the steam engine its operations would be prodigious, while the saving of fuel and attendance would reduce the expenses by one half. To water companies it will shortly become an essential auxiliary, and it will be the duty of those who have the public trust reposed in them to employ it. The same observations will apply to mining operations, either to those conducted by public associations, or by private individuals; with them it is indispensable, as it is the only machine not liable to embarrassment by the presence of sand, gravel, &c. &c. It is well known that many mines, after much delay and expense, have been abandoned from this very cause.

To road surveyors its utility is conspicuously pointed out; in watering the roads, despatch is requisite, as the watering ought to be finished in the early part of the day; double the number of carts may be engaged at once, and the whole be completed in one-quarter the time, and at half the expense.

To breweries it will become a necessary appendage, as it may be easily removed from one place to another; the work will be concluded in one-half the time, or boys may be substituted for men, which, in the course of a year, will produce a material saving. The same remarks are applicable to tanneries, to pump the water and ooze; in distilleries, the wash and spirit; and in dye houses, the dye, &c.; for these purposes the pumps may be constructed of wood, &c. at a very trifling prime cost. For brickmakers, excavators, &c. it is the only pump suitable to their purposes.

The utility of the pump is so general, that it may be said that no establishment of any description is complete unless so provided; in the house, in the garden, in the stable yard, pumps on this improved principle are most particularly adapted, as children or females can work them with the greatest ease, and when out of order, though seldom, they may be repaired without the aid and expense of a plumber.

For the purposes of agriculture in dry seasons, they may be employed on an extensive scale to irrigate the land, as the labour of supplying water is so materially diminished; and when used for the purpose of drainage, large tracts of land may be brought into cultivation.

In nursery grounds and large gardens, where diffusion of water is so essential, they will become a valuable acquisition.

In our West India possessions, and other colonies, where large supplies of water are required for cattle, and numerous other ser-

vices, the fountain pump will become a necessary apparatus; those they have in use at the present time, are, generally speaking, extremely defective; this circumstance arises from the common pump being so soon out of order, from its defect in principle, and from being little understood, except by workmen, who most usually reside at a distance.

Proprietors of estates are, therefore, particularly enjoined to direct their attention to this object, as they can always have the independent means of possessing a superior and more powerful machine, easily repaired, and attended with infinitely less expense. Those who desire to have the ordinary friction pump process replaced by one on the new plan, have no necessity to alter the former arrangement of pipes, machinery, &c.; it would only be requisite to supply a new cylinder and expresser. The principle of the improvement can also be applied to the forcing pump, where it still preserves its extraordinary advantages. For fire engines, deep wells, and to supply elevated situations, it is admirably calculated. In short, to those who are zealous in real improvement, or have economy in view, the fountain pump is earnestly recommended as a machine whereby much time and outlay will be ultimately saved; in every instance where a pump is required, it is infinitely superior, and in some instances it will not admit of substitution.

I am, gentlemen, yours, &c.

JOHN ELLIOTT,
Civil Engineer.

Remarks on the different Modes of Applying Power for Locomotive Purposes.

SIR,—The subject of rail-ways and steam-conveyance at present occupying so much of the public attention, the following brief remarks, on the different modes of applying power for the purpose of locomotion, may not be thought inconsistent with the objects of your publication. In the late exhibitions which took place on the Liverpool and Manchester Rail-way, the tremendous velocity of the engines exceeded not only the most sanguine expectation of the public, but the engineers even who designed and constructed them, have been agreeably surprised at the gratifying results of their own labour and ingenuity. By these performances the opinion which was formerly entertained of the speed in travelling, concomitant with safety, having experienced such an extraordinary revolution, we are prompted to look forward to the future, and endeavour, by taking an impartial view of the subject, to ascertain the limit at which the progressive advancement of improvement will eventually terminate.

The great object which constantly requires to be kept in view in advancing and perfecting the art of locomotion, whether on rail-ways or common roads, is to find out the best and most efficient mode of stowing, economizing, and applying a certain quantity of power, or momentum, sufficient to impel the appended load to a convenient dis-

tance by overcoming the retarding forces, which are always co-existent with every kind of motion. The most important causes of this continued retardation, are the attrition and cohesion of all those parts of an engine, or carriage, which come in contact with each other. Before a carriage, however, has attained the requisite velocity, the moving power has to overcome the whole inertia of the mass corresponding to this velocity; and this at first, and afterwards, when the velocity varies, forms a considerable item in rail-ways of the force required to be exerted in locomotion. When different inclinations obtrude themselves on rail-ways and roads, another cause of retardation presents itself, which requires to be particularly observed when considering the best mode of applying power in overcoming these several obstacles. In the use of them for this purpose, the mode of its generation and application introduce a material waste of power, which it appears impossible to obviate, from no means being applicable for regulating, exactly, the quantity of heat evolved in combustion, or of economizing it by condensing the steam after it has performed its duties. In the usual manner, likewise, of estimating the steam power required to be exerted in moving the same load at different velocities, any increase in the latter is always accompanied by an equal augmentation of the former. But since no difference exists in any of the retarding forces, except that of the increased inertia at first opposing its resistance, it follows that the quantity of power supplied is greater than the force required to be overcome. This waste ensues principally from the rapid vibration of the piston, impeding the transference of the full power with which the steam is charged, and might perhaps be partly obviated by using cylinders of different lengths and diameters, connected by corresponding leverage in such a manner, that although the momentum was sufficient to supply the requisite power, yet the velocity of transference should be at first moderate, and afterwards, by a combination of machinery, gradually augmented till sufficient for direct application to the wheel. But the existence of the other difficulties which have to be encountered, and which have been already enumerated, must completely baffle the success of such expedients.

On the whole, when we contemplate the application of steam power to overcome a resisting force which continually varies, it appears altogether inadequate to sustain that system of economy which it is necessary to preserve. It has presented such serious obstacles to locomotion on common roads, as have, as yet, entirely prevented its successful application; and on rail-ways, although the general effects are striking, on moving over a level track, yet on ascending an inclination of even one in ninety-six, the velocity of the carriage is so far retarded, that if the length of such an inclination exceeded two or three miles, an entire stoppage might be expected, if some more important improvements in the steam locomotives are not effected. In looking forward to the future, therefore, we are warranted to expect some new modification of the system, which may prove adequate to accomplish all that can be desired in remedying the defects which are here taken notice of, and approaching finally

the goal of perfection. The following analytical observations, by ascertaining and examining the causes of insufficiency, appear to hint at these requisite modifications, although the adoption of the views here taken of this subject, must be entirely influenced by the judgment derived from the practical experience of professional men.

From what has already been observed, it will have been rendered obvious that the steam-engine works to most advantage, when it communicates adequate force by a moderate velocity of the piston; to apply this kind of power, therefore, to the purposes of locomotion, an intermediate agent becomes necessary, which, by receiving the continued and unvaried supply, may act as a reservoir of force, which could always furnish the exact quantity of power competent to sustain the carriage at the same velocity. This agent requires to unite portability with the capability of receiving and transmitting the same power without loss; it must be, therefore, elastic and of a minimum weight; in fine, an aeriform fluid appears in the most perfect manner to be endued with all the requisite essentials for this purpose. We are in this manner led to the direct conclusion, that the most expedient method of supplying power to a locomotive carriage is from a reservoir of condensed air, which may be continually replenished by the unvarying action of steam. In condensing air, when no time is allowed for the heat to dissipate, the mass acquires an increase of temperature equal to one degree of Fahrenheit's scale for every condensation equal to 1-480 of the whole bulk. Thus, when the chamber which contains the air is small in comparison to the velocity of condensation, a quantity of heat will be extricated, which will materially add to the elastic force, and therefore to the power required to be applied, which will be immediately lost in the reservoir from the balance of temperature being restored. To remedy this, it becomes necessary that the primary condensation takes place in a large chamber, where time might be allowed for the superabundant heat to disperse. But this is not concomitant with the maximum bulk, which it is necessary both engine and reservoir should occupy in a locomotive carriage; a separation must therefore ensue, and whilst the steam-engine is stationary, the reservoir of the locomotive might be supplied by others of superior magnitude, appended to a stationary engine situated at each end of the rail-way, if not exceeding 30 or 40 miles in length, or when longer at convenient intermediate stages. By following this mode of arrangement, the air would have an equal temperature, and, from the size of the chamber affixed to the carriage, the contained air, during the process of exhaustion, would have time to supply the transient deficiency of temperature from the ambient atmosphere, whilst the velocity of its motion would tend further instantaneously to restore the equilibrium.

Many particulars are, however, to be minutely considered before the practicability of this mode of storing up power can be demonstrated; the most important of them shall here be attempted to be submitted to rigorous calculation, although practical proof can alone establish the efficacy of the principles upon which it is founded.

The elasticity of air augments in a ratio nearly equal to that of condensation; since the pressure, therefore, of the atmosphere is nearly 15 lbs. on the square inch, when condensed air is confined in a vessel it will exert on a square inch of its surface a pressure equivalent in pounds to 15 times the number of enclosed atmospheres. If the power of traction be represented by the constant impeding force, multiplied by the space gone over, the momentum of elasticity contained in the reservoir, calculated in a similar way, must be equivalent to this product. Thus, if the space required to be gone over in inches is represented by S, the constant force of retardation in pounds by W, the contents of the reservoir in cubic inches by C, and the number of contained atmospheres by A, then $SW = \frac{15\ A^2 C}{2}$: if any three of these quantities are therefore given, the fourth may be found by this equation. If A is supposed constant, and equal to 50, while we reckon W = 500, which, on a level rail-way, is sufficient to draw a load of about 45 tons; the contemporaneous values of S and C may be exhibited in miles and cubic feet, forming the two first columns of the following table:—

S in miles	C in cubic feet	C increased five times	Diameter of spherical chamber.
1	.978	4.890	2.106
5	4.890	24.450	3.601
8	7.824	39.120	4.212
10	9.780	48.900	4.537
12	11.736	58.680	4.822
15	14.670	73.350	5.191
18	17.604	88.020	5.517
20	19.560	97.800	5.716
25	24.450	122.250	6.157
30	29.340	146.700	6.541
35	34.230	171.150	6.886
40	39.120	195.600	7.202

The third column represents the values of C, increased five times, that the whole quantity, which is required to be abstracted from the reservoir, may not introduce any inconvenient change of density; which, by varying and lessening the expansive energy, may render it inapplicable to the machinery through which it acts. The fourth column shows the dimensions of the reservoir, considered as spherical, although two or more smaller vessels may contain together as much as one of larger dimensions, without requiring a greater weight of metal (see note A.)

Note (A.) If t represents the thickness of the shell of a spherical chamber, D its diameter, p the pressure on its internal surface, and M the modulus of cohesion of the substance composing the shell, then $p\ D = 4\ M\ t$. Let d represent

In ascending any inclination, the extra force required to be expended will be proportioned to the load multiplied by the whole height of ascent. In addition, therefore, to the whole distance on rail-ways and roads considered as level, there must be included the sum of the heights of all the ascents which occur in this distance, and the power expended in both, estimated according to the foregoing methods, will give the full quantity required to be supplied to a locomotive carriage. To illustrate this, let the Liverpool and Manchester Rail-way be taken as an example. The whole length is 29 miles, which, by the third column of the table, gives the number of cubic feet 141.8. In proceeding from the west to the eastern termination of the rail-way, the sum of all the ascents amounts to 230 feet; and although the descents amount to 141 feet, which will materially lessen the power required to be exerted, yet this advantage may be overlooked from the impossibility of exactly estimating it; and the quantity of condensed air to be allowed for the rise of 230 feet will amount to $500 \times 200 \times 230 = SW = \frac{15\ A^2 C}{2}$, or $C = 8.5$ and $5\ C = 42.6$. The whole number of cubic feet will therefore be 184.4, which is the contents of a spherical chamber, 7 feet in diameter, or of two, $5\frac{1}{2}$ feet each. We may, therefore, consider a reservoir of these dimensions, when applied to a locomotive carriage, sufficient for the conveyance of a load of 45 tons, the whole length of the Liverpool and Manchester Rail-way.

Various mechanical expedients suggest themselves as necessary apparatus, to connect the store of power with the wheels of the carriage; but, indeed, little difficulty can be experienced in suiting the arrangements of machinery to the exigencies which present themselves, although they must differ considerably from the usual mode of forming the cylinder and valves of the steam-engine, and must

the evanescent linear magnitude of supposed distension; the increment of surface corresponding to the assumed diameter $D + 2\delta$ will be $4\pi^*\ D\delta + 4\pi\delta^2$, which also represents the virtual velocity of the cohesive momentum of the spherical shell. This being equably distended, the force will be equally exerted in every direction, and may be resolved into two which shall be equal and perpendicular to each other. If the substance of the shell, retaining the original thickness, was arranged in the form of a square, the virtual velocity in the direction of one side will be represented by $2\pi D\delta$, and, multiplied by Mt, gives the virtual momentum of cohesion $= 2\pi D\delta Mt$. The virtual momentum of pressure, which is to counterbalance this, being half the aggregate of the distending force on the whole surface will be represented by $\frac{1}{2}\pi p D^2\delta$, which being equal to $2\pi D\delta Mt$, by reducing the equation, we have $4\ Mt = p\ D$ or $t = \frac{p\ D}{4\ M}$, $D = \frac{4\ M\ t}{p}$ and $p = \frac{4\ M\ t}{F}$. Thus, if we suppose the elasticity of air proportional to its density, the quantity of material necessary to confine, by this mode, the same quantity of power, is always constant, whatever be the diameter of the spherical chamber; for quantity of power $\cdot\| \cdot p\ D^3$ and quantity of material $\cdot\| \cdot t\ D^2$, but $p\ D^3 \cdot\| \cdot 4\ Mt\ D^2 \cdot\| \cdot t\ D^2$, therefore $p\ D^3 \cdot\| \cdot t\ D^2$.

* π Here represents the ratio of the circumference of the circle to its diameter.

be accommodated to variations in the elasticity of the condensed air, and in the velocity of the carriage.

The next subject of any importance to be considered in estimating the expediency of the system, is the weight of the reservoir and necessary appendages of the carriage, that a comparison may be instituted between this and the present weight of locomotives, with the fuel and water necessary to carry them 30 miles. From the formula before demonstrated (see note A,) the thickness of an iron spherical chamber, 7 feet in diameter, perfectly sufficient to sustain pressure of 50 atmospheres on its internal surface will be 1.05 inches, and the whole metal required $= 7^3 \times 3.1416 \times .0875 =$ 13.468 cubic feet; which, at 480 lbs. per cubic foot, amounts to 2 tons 18 cwt. and estimating the attending machinery and framework of the carriage as a maximum at 1 ton, we have about 4 tons for the whole weight of the carriage, which would be reduced to $2\frac{1}{2}$ if it renewed its supply, like the steam-engine, at the end of 15 miles. Thus it competes with the lightest locomotive that has yet been constructed, that if the weight of the water and fuel, which must accompany every steam locomotive, be included in the estimate, it must eventually display a decided superiority.

[TO BE CONTINUED.]

On Gunpowders and Detonating Matches. *By* ANDREW URE, M. D. F. R. S. &c.

(Concluded from page 112.)

3. *On the Charcoal.*

TENDER and light woods, capable of affording a friable and porous charcoal, which burns rapidly away, leaving the smallest residuum of ashes, and containing, therefore, the largest proportion of carbon, ought to be preferred for charring in gunpowder works.

After many trials, made long ago, black dogwood came to be preferred to every plant for this purpose, but modern experiments have proved, that many others afford an equally suitable charcoal. The woods of black alder, poplar, lime tree, horse chesnut, and chesnut tree, were carbonized in exactly similar circumstances, and a similar gunpowder was made with each, which was proved by the same proof mortar: the following results were obtained:—

	Toises.	Feet.
Poplar—mean range,	113	2
Black alder,	110	4
Lime,	110	3
Horse chesnut,	110	3
Chesnut tree	109	

By subsequent experiments, confirmatory of the above, it has been further found, that the willow presents the same advantages as the poplar, and that several shrubs, such as the hazel nut, the spindle tree, the dogberry, the elder tree, the common sallow, and some others, may be as beneficially employed; but whichever wood be

used, we should always cut it when full of sap, and never after it is dead; we should choose branches not more than five or six years old, and strip them carefully, because the old branches and the bark contain a larger proportion of earthy constituents. The branches ought not to exceed three-quarters of an inch in thickness, and the larger ones should be divided lengthwise into four, so that the pith may be readily burned away.

Wood is commonly carbonized, in this country, into gunpowder charcoal, in cast iron cylinders, with their axes laid horizontally, and built in brick work, so that the flame of a furnace may circulate round them. One end of the cylinder is furnished with a door, for the introduction of the wood and the removal of the charcoal; the other end terminates in a pipe, connected with a worm tube, for condensing the pyroligneous acid, and giving vent to the carburetted hydrogen gases that are disengaged. Towards the end of the operation, the connexion of the cylinder with the pyroligneous acid cistern ought to be cut off, and a very free egress opened for the volatile matter, otherwise the charcoal is apt to get coated with a fuliginous varnish, and to be even penetrated with condensable matters, which materially injure its qualities.

In France the wood is carbonized for the gunpowder works, either in oblong vaulted ovens, or in pits, lined with brick work or cylinders of strong sheet iron. In either case the heat is derived from the imperfect combustion of the wood itself to be charred. In general, the product in charcoal by this method, is from sixteen to seventeen parts by weight, from one hundred of wood. The pit process is supposed to afford a more productive return and a better article, since the body of wood is much greater, and the fuliginous vapours are allowed a freer escape. The surface of a good charcoal should be smooth, but not glistening.

The charcoal is considered, by the most scientific manufacturers, to be the ingredient most influential, by its fluctuating qualities, on the composition of gunpowder; and therefore it ought always to be prepared under the vigilant and skilful eye of the director of the powder establishment. If it has been kept for some time, or quenched at first with water, it is unsuitable for the present purpose. Charcoal, extinguished in a close vessel by exclusion of air, and afterwards exposed to the atmosphere, absorbs only from three to four per cent. of moisture; while red hot charcoal, quenched with water, may lose by drying twenty-nine per cent. When the latter sort of charcoal is used for gunpowder, a compensation in weight must be made for the water present: but charcoal, which has remained long impregnated with moisture, affords a most detrimental constituent to gunpowder.

4. *On mixing the Constituents and forming the Powder.*

The three ingredients being thus prepared, are ready for manufacturing into gunpowder; they are, 1st, separately ground to a fine powder, which is passed through proper silk sieves or bolting machines; 2nd, they are mixed together in the proper proportions,

which we shall afterwards discuss; 3d, the composition is then sent to the gunpowder mill, which consists of two edge stones of a calcareous kind, turning by means of a horizontal shaft, on a bed stone of the same nature, incapable of affording sparks by collision with steel, as sand stones would do. On this bed stone the composition is spread, and moistened with as small a quantity of water as will, in conjunction with the weight of the revolving stones, bring it into a proper body of *cake*, but by no means to a pasty state. The line of contact of the rolling edge stone is constantly preceded by a hard copper scraper, which goes round with the wheel, regularly collecting the caking mass, and bringing it into the track of the stone. From fifty to sixty pounds of cake are usually worked at one operation under each mill stone. When the mass has thus been thoroughly kneaded and incorporated, it is sent to the corning-house, where a separate mill is employed to form the cake into grains or corns. Here it is first pressed into a hard firm mass, then broken into small lumps, after which the corning process is performed by placing these lumps in sieves, on each of which is laid a disk or flat cake of *lignum vitæ*. The sieves are made of parchment skins, perforated with a multitude of round holes. Several such sieves are fixed in a frame, which, by proper machinery, has such a motion given to it, as to make the *lignum vitæ runner* in each sieve move about with considerable velocity, so as to break down the lumps of the cake, and force its substance through the holes, in grains of certain sizes. These granular particles are afterwards separated from the finer dust by proper sieves and reels.

The corned powder must now be hardened, and its rougher angles removed, by causing it to revolve in a close reel or cask, turning rapidly round its axis. This vessel resembles somewhat a barrel churn, and is frequently furnished inside with square bars, parallel to its axis, to aid the polish by attrition.

The gunpowder is finally dried, which is now done generally with a steam heat, or in some places by transmitting a current of air, previously heated in another chamber, over canvass shelves, covered with the damp grains of powder.

5. *On the Proportion of the Constituents.*

A very extensive suite of experiments, to determine the proportions of the constituents for producing the best gunpowder, was made at the Essonne works, by a commission of French chemists and artillerists, in 1794.

Powders, in the five following proportions, were prepared:—

	Nitre.	Charcoal.	Sulphur.	
1	76	14	10	Gunpowder of Bâle.
2	76	12	12	Gunpowder works at Grenelle.
3	76	15	9	M. Guyton de Morveau.
4	77.32	13.44	9.24	Idem.
5	77.5	15	7.5	M. Riffault.

The result of more than two hundred discharges, with the *proof mortar*, showed that the first and third gunpowders were the strong-

est, and the commissioners in consequence recommended the adoption of the third proportions; but a few years thereafter it was thought proper to substitute the first set of proportions, which had been found equal in force to the other, as they would have a better keeping quality, from containing a little more sulphur and less charcoal. More recently still, so strongly impressed have the French government been, with the high value of durability in gunpowders, that they have returned to their ancient *dosage* of seventy-five nitre, twelve and a half charcoal, and twelve and a half sulphur. In this mixture the proportion of the substance, powerfully absorbent of moisture, viz. the charcoal, is still further reduced, and replaced by the sulphur or the conservative ingredient.

If we inquire how the *maximum* gaseous volume is to be produced, from the chemical reaction of the elements of nitre on charcoal and sulphur, we shall find it to be by the generation of carbonic oxide and sulphurous acid, with the disengagement of nitrogen. This will lead us to the following proportions of these constituents:—

	Hydrogen=1	Per Cent.
1 prime equivalent of nitre,	102	75.00
1 " " sulphur	16	11.77
3 " " charcoal	18	13.23
	136	100.00

The nitre contains five primes of oxygen, of which three, combining with the three of charcoal, will furnish three of carbonic oxide gas, while the remaining two will convert the one prime of sulphur into sulphurous acid gas; the single prime of nitrogen is, therefore, in this view, disengaged alone.

The gaseous volume, on this supposition, evolved from one hundred and thirty-six grains of gunpowder, equivalent in bulk to seventy-five grains and a half of water, or to three-tenths of a cubic inch, will be, at the atmospheric temperature, as follows:—

	Grains.		Cubic inches.
Carbonic oxide,	42	=	141.6
Sulphurous acid,	32	=	47.2
Nitrogen,	14	=	47.4
			236.2

being an expansion of one volume into 787.3. But as the temperature of the gases, at the instant of their combustive formation, must be incandescent, this volume may be safely estimated at three times the above amount, or considerably upwards of two thousand times the bulk of the explosive solid.

But this theoretical account of the gases developed, does not well accord with the experimental products usually assigned, though these are probably not altogether exact. Much carbonic acid is said to be disengaged, a large quantity of nitrogen, a little oxide of carbon, *steam of water, with carburetted and sulphuretted hydrogen.* From experiments, to be presently detailed, I am convinced, that the amount of these latter products, printed in italics, must be very

inconsiderable indeed, and unworthy of ranking in the calculation; for, in fact, fresh gunpowder does not contain above one *per cent.* of water, and can therefore yield little hydrogenated matter, nor is the hydrogen in the carbon of any consequence.

It is obvious, that the more sulphur is present, the more of the dense sulphurous acid will be generated, and the less forcibly explosive will be the gunpowder. This is sufficiently confirmed by the trials at Essonne, where the gunpowder that contained twelve of sulphur and twelve of charcoal in one hundred parts, did not throw the *proof shell* so far as that which contained only nine of sulphur and fifteen of charcoal; the conservative property is, however, so capital, especially for the supply of our remote colonies, and for humid climates, that it justifies a slight sacrifice of strength, which at any rate may be compensated by a small addition of charge.

Table of Composition of different Gunpowders.

	Nitre.	Charcoal.	Sulphur.
Royal Mills at Waltham Abbey,	75	15	10
France, national establishment,	75	12.5	12.5
French, for sportsmen,	78	12	10
———, for mining,	65	15	20
United States of America,	75	12.5	12.5
Prussia,	75	12.5	12.5
Russia,	78.78	13.59	12.63
Austria,	76	11.5	12.5
Spain,	76.47	10.78	12.75
Switzerland, (a round powder,)	76	14	10
Chinese,	75	14.4	9.9
Theoretical proportions, (as above,)	75	13.23	11.17

6. *On the Chemical Examination of Gunpowders.*

I have treated five different samples; 1. The government powder, made at Waltham Abbey; 2. Glass gunpowder, made by John Hall, Dartford; 3. The treble strong gunpowder of Charles Lawrence and son; 4. The Dartford gunpowder of Pigou and Wilks; 5. Superfine treble strong sporting gunpowder of Curtis and Harvey. The first is coarse grained, the others are all of considerable fineness. The specific gravity of each was taken in oil of turpentine; that of the first and last three was exactly the same, being 1.80; that of the second was 1.793, reduced to water as unity.

The above density for specimen first, may be calculated thus:—

75 parts of nitre, specific gravity = 2.000
15 parts of charcoal, specific gr. = 1.154
10 parts of sulphur, specific gr. = 2.000

The volume of these constituents is 55.5, by which, if their weight, 100, be divided, the quotient is 1.80.

The specific gravity of the first and second of the above powders, including the interstices of their grains, after being well shaken down in a phial, is 1.02. This is a curious result, as the size of the grains is extremely different. That of Pigou and Wilks, similarly tried, is

only 0.99; that of the battle powder is 1.03, and that of Curtis and Harvey is nearly 1.05. Gunpowders thus appear to have nearly the same weight as water, under an equal bulk; so that an imperial gallon will hold from ten pounds to ten pounds and a half, as above shown.

The quantity of water that 100 grains of each part with on a steam bath, and absorbed when placed for twenty-four hours under a moistened receiver standing in water, are as follows:—

100 grains of Waltham Abbey, lose	1.1	by steam heat, gain	0.8	over water.
Hall,	0.5		2.2	
Lawrence,	1.0		1.1	
Pigou and Wilks,	0.6		2.2	
Curtis and Harvey,	0.9		1.7	

Thus, we perceive, that the large grained government powder resists the hygrometric influence better than the others; among which, however, Lawrence's ranks nearly as high; these two are, therefore, relatively the best keeping gunpowders of the series.

The process, most commonly practised in the analysis of gunpowder, seems to be tolerably exact. The nitre is first separated by hot distilled water, evaporated, and weighed. A minute loss of salt may be counted on, from its known volatility with boiling water. I have evaporated always on a steam bath. It is probable, that a small proportion of the lighter and looser constituent of gunpowder, the carbon, flies off in the operations of corning and dusting; hence, analysis may show a small deficit of charcoal below the synthetic proportions originally mixed. The residuum of charcoal and sulphur, left on the double filter paper, being well dried by the heat of ordinary steam, is estimated, as usual, by the difference of weight of the inner and outer papers. This residuum is cleared off into a platina capsule with a tooth brush, and digested in a dilute solution of potash, at a boiling temperature. Three parts of potash are fully sufficient to dissolve out one of sulphur. When the above solution is thrown on a filter, and washed first with a very dilute solution of potash, boiling hot, then with boiling water, and afterwards dried, the carbon will remain; the weight of which, deducted from that of the mixed powder, will show the amount of sulphur.

I have tried many other modes of estimating the sulphur in gunpowder more directly, but with little satisfaction in the results. When a platina capsule, containing gunpowder spread on its bottom, is floated in oil, heated to 400° Faht. a brisk exhalation of sulphur fumes rises, but at the end of several hours, the loss does not amount to more than half the sulphur present.

The mixed residuum of charcoal and sulphur, digested in hot oil of turpentine, gives up the sulphur readily, but to separate again the last portions of the oil from the charcoal or sulphur is hardly possible.

When gunpowder is digested with chlorate of potash and dilute muriatic acid, at a moderate heat, in a retort, the sulphur is acidified; but this process is disagreeable and slow, and consumes much chlorate. The resulting sulphuric acid, being tested by nitrate of baryta,

indicates, of course, the quantity of sulphur in the gunpowder. A curious fact occurred to me in this experiment:—After the sulphur and charcoal of the gunpowder had been quite acidified, I poured some solution of the baryta salt into the mixture, but no cloud of sulphate ensued. On evaporating to dryness, however, and redissolving, the nitrate of baryta became effective, and enabled me to estimate the sulphuric acid generated, which was, of course, ten for every four of sulphur.

The acidification of the sulphur, by nitric or nitromuriatic acid, is likewise a slow and unpleasant operation.

By digesting gunpowder with potash water, so as to convert its sulphur into a sulphuret, mixing this with nitre in great excess, drying and igniting, I had hoped to convert the sulphur readily into sulphuric acid; but on treating the fused mass with dilute nitric acid, more or less *sulphurous* acid was exhaled; this occurred, even though chlorate of potash had been mixed with the nitre to aid the oxigenation.

The following are the results of my analysis, conducted by the first described method:—

100 grains afford, of	Nitre.	Charcoal.	Sulphur.	Water.	
Waltham Abbey	74.5	14.4	10.0	1.1	
Hall, Dartford	76.2	14.0	9.0	0.5	loss 0.3
Pigou and Wilks	77.4	13.5	8.5	0.6	
Curtis and Harvey	76.7	12.5	9.0	1.1	loss 0.7
Battle gunpowder	77.0	13.5	8.0	0.8	loss 0.7

It is probable, for reasons already assigned, that the proportions mixed by the manufacturers may differ slightly from the above.

The English sporting gunpowders have long been an object of desire and emulation in France: their great superiority for fowling-pieces, over the product of the French national manufactories, is indisputable: unwilling to ascribe this superiority to any genuine cause, M. Vergnaud, Captain of French artillery, in a little work on fulminating powders, lately published, asserts *positively*, that the English manufacturers of "poudre de chasse" are guilty of the "chalatanisme" of mixing fulminating mercury with it. To determine what truth was in this allegation, with regard at least to the above five celebrated gunpowders, I made the following experiments:—

One grain of fulminating mercury, in crystalline particles, was mixed in water with 200 grains of the Waltham Abbey gunpowder, and the mixture was digested over a lamp, with a very little muriatic acid. The filtered liquid gave manifest indications of the corrosive sublimate, into which fulminating mercury is instantly convertible by muriatic acid, for copper was quicksilvered by it—potash caused a white cloud in it, that became yellow, and sulphuretted hydrogen gas separated a dirty yellow white precipitate of bisulphuret of mercury. When the Waltham Abbey powder was treated alone with dilute muriatic acid, no effect whatever was produced on the filtered liquid by the sulphuretted hydrogen gas.

Two hundred grains of each of the above sporting gunpowders were treated precisely in the same way, but no trace of mercury was

obtained by the severest tests. Since, by this process, there is no doubt but one 10-1000th part of fulminating mercury could be detected, we may conclude, that Captain Vergnaud's charge is groundless. The superiority of our sporting gunpowders is due to the same cause as the superiority of our cotton fabrics; the care of our manufacturers in selecting the best materials, and their skill in combining them.

7. *On Detonating Matches.*

This subject has been so ably treated in the report of MM. Aubert, Pellissier, and Gay Lussac, that I shall confine myself to a few observations, the results chiefly of my own experience.

Mr. Howard's proportions of the ingredients for preparing his fulminate of mercury, are—

Mercury, - - - - - - - - -	100 grains.
Nitric acid, sp. gr. 1.3, 1½ measured ounces -	= 884
Strong alcohol, 2 measured ounces, - - -	= 750

The mercury is dissolved by heat in the acid—the solution is allowed to cool to a blood heat, and then poured into the alcohol. On heating the mixture slightly, an effervescence soon ensues, the commencement of which is the signal for removing the heat from the matrass or retort, for if it be continued for some time longer, the chemical action will become furious, and the fulminate will be injured by an admixture of subnitrate of mercury. After the crystalline powder precipitates, the whole is to be thrown on a filter, washed, and dried on a steam bath.

The authors of the above report say, the best proportions are those of Howard, but they appear to estimate them incorrectly, for they prescribe twelve of nitric acid and twelve of alcohol, (by weight,) to one of mercury; we may hence infer, that considerable latitude may be used in the proportions of the materials. I consider the latter ones wasteful, since 100 of mercury, with 950 of nitric acid, 1.35 and 850 alcohol 0.835, produce about 120 parts of a perfect fulminate. The supernatant liquid retains nearly five per cent. of the mercury, for five grains of a dark gray oxide may be obtained from it by ammonia.

I have analyzed the match powder collected from fifty detonating caps of French manufacture, taken from a stock found to answer very well in practice. The whole weighed exactly 16.3 grains, being about one-third of a grain per cap. Treated with hot water, it yielded 8.5 grains of soluble matter, of which 7.0 grains were nitre, and 1.5 nitrate of mercury, derived from the ill made fulminate. By boiling again in water, this passed into a yellow subnitrate.

7.2 grains of insoluble matter were brushed off the dried filter, and heated with dilute muriatic acid. The solution being thrown on a filter, this retained one grain of carbon and sulphur, while 6.2 grains of fulminate of mercury passed through in the state of a bichloride. The proportions of this match powder must have been, therefore, eight grains of a kind of gunpowder, and about eight of

indifferent fulminate of mercury, and yet it exploded very well; it obviously contained more nitre than usually enters into gunpowder.

The proportions deduced by the French commissioners, from their elaborate and able researches, are ten of fulminate and six of pulverin, (gunpowder meal.)

One hundred grains of fulminate, triturated with a wooden mullar on marble, with thirty grains of water and sixty of gunpowder, are sufficient to mount four hundred detonating caps.

In describing the formation of fulminating mercury, I omitted a curious fact that lately occurred to me. Desirous of moderating the reaction of the mixture which had been overheated, I added a little alcohol from time to time, till its quantity was increased by nearly one-half. The fulminate being washed, and laid out on the filtering paper in the air, when nearly dry, minute brilliant points were observed to start up on different parts of its surface, which becoming larger, were found to be globules of mercury: this metallization went silently and slowly on till nearly one-half of the powder disappeared: an ethereous hydrocarbonate was evidently the agent in this unexpected reduction. [*Journ. Royal Institution.*

REPORT ON MR. BABBAGE'S CALCULATING ENGINE.

Report of the Committee appointed by the Council of the Royal Society, to consider the subject referred to in Mr. Stewart's Letter, relative to Mr. Babbage's Calculating Engine, and to report thereupon.

Your committee, in this their report, have no intention of entering into any consideration of the abstract mathematical principle on which the practicability of such a machine as Mr. Babbage's relies, nor of its public utility when completed. They consider the former as not only sufficiently clear in itself, but as already admitted and acted on by the council in their former proceedings. The latter they regard as obvious to every one who considers the immense advantage of accurate numerical tables in all matters of calculation, especially in those which relate to astronomy and navigation, and the great variety and extent of those which it is professedly the object, and within the compass of Mr. Babbage's engine to calculate, and print with perfect accuracy.

The original object of the present machine was to compute any tables which could be calculated by six orders of differences, and twelve figures in each, and sixteen figures in the table itself, in such a form that, by bestowing a very moderate degree of attention to their publication, it would be impossible for a single figure to be erroneous; and supposing any person employing them to entertain a doubt whether that moderate degree of care had been bestowed, he might in a short time himself verify the tables. The machine was intended to produce the work stamped on plates of copper, or other proper material.

Besides the cheapness and celerity of calculation to be expected from it, the absolute accuracy of the printed results being one of the prominent pretensions of Mr. Babbage's undertaking, the attention of your committee has been especially directed, both by careful examination of the work already executed, and of the drawings, and by repeated conferences with Mr. Babbage to this point. And the result of their inquiry, is, that such precautions appear to have been taken in every part of the contrivance and work which they have examined, and so fully aware does the inventor appear to be of every circumstance which may by possibility introduce error, that they have no hesitation in saying they believe these precautions effectual, and that whatever the engine does it will do truly.

In the actual execution of the work they find that Mr. Babbage has made a progress, which, considering the very great difficulties to be overcome in an undertaking so novel, they regard as fully equalling any expectations that could reasonably have been formed: and that although several years have now elapsed since the first commencement, yet that when the necessity of constructing plans, sections, elevations, and working drawings of every part; that of constructing, and in many cases inventing, tools and machinery of great expense and complexity, (and in many instances of ingenious contrivances, and likely to prove useful for other purposes hereafter,) for forming with the requisite precision parts of the apparatus dissimilar to any used in ordinary mechanical works; that of making many previous trials to ascertain the validity of proposed movements; and that of altering, improving, and simplifying those already contrived and reduced to drawings; your committee are so far from being surprised at the time it has occupied to bring it to its present state, that they feel more disposed to wonder it has been possible to accomplish so much.

The drawings form a large and most essential part of the work; they are executed with extraordinary care and precision, and may be regarded as among the best that have ever been constructed. On these all the contrivance has been bestowed, and all the alterations made, so that scarcely any work excepting drawing has been thrown away. When it is mentioned that upwards of 400 square feet of surface are covered with drawings, many of them of the most elaborate description, it will easily be understood that a very great expense of time, thought, and capital, must have been incurred in producing them, but without which your committee consider that success would have been impossible.

Nearly the whole of this department of the work, (according to Mr. Babbage's statements, probably nine-tenths,) is completed, and what remains is of a nature to afford no difficulty on the score of contrivance; so that there is no reason why the execution of the work, (hitherto necessarily retarded till the completion of the drawings,) could not now proceed with rapidity; and according to what the committee have been enabled to gather from Mr. Babbage's statements and their own observations, and supposing no unexpected

cause of delay, they regard a further period of three years as probably sufficient for its completion.

In judging of the adequacy of Mr. Babbage's work to complete the objects for which it was intended, there are two distinct questions—the adequacy of the contrivance, and that of the execution. On the former point every explanation has been afforded by Mr. Babbage, and both the drawings and the work executed have been unreservedly subjected to their discussion, and have been such as to excite a well grounded confidence. The movements are combined with all the skill and system which the most experienced workmanship could suggest.

But in so complex a work, in which interrupted motions are propagated simultaneously along a great variety of trains of mechanism, it might be apprehended that obstacles would occur, or even incompatibilities arise, from the impracticability of foreseeing all the possible combinations of the parts, and of which, on a mere inspection, your committee could not be expected to form a judgment. But this doubt, should it arise, your committee consider as fully and satisfactorily removed by the constant employment by Mr. Babbage of a system of mechanical notation, devised by himself, and explained in a paper in the Transactions of this Society; which places at every instant the progress of motion through all parts of this or any other mechanism distinctly in view, and, by an exact tabulation of the times required for all the movements, renders it easy to avoid all danger of two contradictory impulses arriving at the same instant at any part.

Of the adequacy of the machinery to work under all the friction and strain to which it can ever be fairly exposed, and of its durability, your committee have not the least doubt. Great precautions are taken to prevent the wear of the parts by friction; and the strength, solidity, and equilibrium, in the whole apparatus, ensure it from all danger on the score of violence or constant wear.

It ought also constantly to be borne in mind, that in all those parts of the machine where the nicest precision is required, the wheel work only brings them by a first approximation, (though a very nice one,) to their destined places; they are then settled into accurate adjustment by peculiar contrivances, which admit of no shake or latitude of any kind.

The machine consists essentially of two parts, a calculating part and a printing part. These are both equally essential to the fulfilment of Mr. Babbage's views; for the whole advantage would be lost, if the computations made by the machine were copied off by human hands and transferred to type by the usual process. The actual work of the calculating part is in great measure constructed, although not put together, a portion only having been temporarily fitted up for the inspection of the committee; and from its admirable workmanship they have been able to form a confident opinion that it will execute the work expected from it. At the same time, the committee cannot but observe that, had inferior workmanship been resorted to, such is the number and complexity of the parts,

and such the manner in which they are fitted together, the success of the undertaking would have been hazarded; and they regard as extremely judicious, although, of course, very expensive, Mr. Babbage's determination to admit of nothing but the very best and most finished work in every part; a contrary course would have been false economy, and might have led to the loss of the whole capital expended on it.

In the printing part less progress has been made in actual execution than in the calculating. The reason being the greater difficulty of its contrivance, not for transferring the computations from the calculating part to the copper, or other plate ultimately destined to receive them, but for giving to the plate itself the number and variety of movements which the forms adopted in printed tables may call for in practice. The movements necessary for effecting this, being entirely such as might at any time be decided on, were purposely allowed to stand over till the more difficult parts should be fully developed. Taking the calculating and the printing part together, and regarding the tools and machinery already erected as available for the performance of what remains, the committee regard it as not improbable that three-fifths of the work may be already completed, but they cannot be expected to state this with any degree of certainty.

With regard to the expense incurred, and likely to be incurred, Mr. Babbage states the sum already expended by him at £6000; £1000 of which he states to have been laid out in preliminary trials, which have not formed an object of inquiry with the committee. Taking into consideration the extent of the work and drawings, which they have examined, and judging entirely from the general knowledge of the cost of these and similar works, which the professional experience of several individuals of the committee has enabled them to acquire, they are no way surprised at the outlay thus stated to have been incurred. With regard to the future cost, they have, of course, less means of judging than of the past,—of which they see the results, and the tools with which they have been produced. A probable conjecture might be grounded on the proportion of $\frac{3}{5}$, assumed as the proportion of the work already done; but this would require to be received with very great latitude.

Finally, taking into consideration all that has been already said, and relying not less on the talent and skill displayed by Mr. Babbage as a mechanician, in the prosecution of this arduous undertaking, for what remains,—than on the matured and digested plan and admirable execution of what is accomplished, your committee have no hesitation in giving it as their opinion, that "in the present state of Mr. Babbage's engine, they do regard it as likely to fulfil the expectations entertained of it by its inventor."

(Signed,) I. F. W. Herschel.
Chairman.

New System of Water Power.

A DESCRIPTION and plans of a mode of supplying public works with water as a moving power in all situations, and at all seasons of the year, have been introduced lately into Scotland, by an engineer of the name of Thom, which promises to be of the greatest advantage to this country, not only as offering a cheap substitute for steam power, but as lending a powerful aid to the amelioration of the condition of the working classes, and perhaps of becoming the means of removing the intolerable nuisance of smoke in large towns. This plan of water power which has been adopted at Grenock on a beautiful water fall of 512 feet high above the level of the sea, is capable of universal application throughout the island, and is rendered complete by the contrivance of a series of self-acting sluices adapted to every site and state of the weather, all the invention of the engineer who had the honour of first submitting the plan to the public. The success of the method at Rothsay, in the Isle of Bute, where it originated, induced a company of patriotic gentlemen in Grenock to lend themselves to the undertaking, and their works now, nearly finished, form one of the greatest wonders of art in the country. The rains collected from a number of barren hills in the neighbourhood of Grenock, are collected into a large natural reservoir at their base, and conveyed along the face of mountains, carried across deep ravines, and conducted along the edge of rocky precipices, in a gently sloping aqueduct about six miles long, to the brow of a hill surmounting the town; thence the water is led along in small aqueducts or lades to the mills, which are situated on the face of the hill, amounting to thirty-three in number, and from their various heights, being placed necessarily below each other, yielding a power arising from the extent of their falls equal to that of 2000 horses, as appears by the report of the company's engineer; and if certain improvements be afterwards made, they may be made to yield a power equal to that of 3000 horses, a mechanical power, far exceeding that of the great manufacturing town of Glasgow, and populous vicinity. The water collected into the great natural reservoir with some auxiliaries is drained from about 4890 acres of ground; it covers about 300 acres, in which the water stands about 46 feet deep, and it is capable of containing about 300 millions of cubic feet of water, or of discharging 600 millions of cubic feet annually; so that besides supplying the town of Grenock amply with water for culinary purposes to the amount of 50 millions of cubic feet annually, the reservoir can furnish 2464 cubic feet of water for 310 days, (the working days,) in the year; for the period of 12 hours a day. The most astonishing circumstance regarding this immense public undertaking, is, that they can afford to give their water so cheap to the people who take their mills, that the price of a horse's power is reduced to about the 20th part of what it would cost were it derived from steam. The expense of steam engines and fuel would, by the general adoption of this plan throughout the country, be entirely done away with. Coals, and many articles of consumption, would be rendered cheap-

er; the smoke of public works would be abolished in a more effectual way than by burning; and the health and morals of the lower classes, the last, but not the least important of the advantages, to be derived from it, would be improved by the removal of manufactories from confined situations in crowded towns, to airy and salubrious situations in the country. [*New Monthly Magazine, for* 1829.

Effect of Iodine upon Germination.

A SERIES of comparative experiments have been made by M. Canter, upon the germination and vegetation of plants moistened with water, solution of chlorine, and solution of iodine, the latter of equal density. The following are his conclusions: 1st, iodine is generally more effectual than chlorine in facilitating the germination of seeds; 2nd, iodine produces this effect by stimulating the germen of the seeds in the same manner as oxygen and chlorine; 3d, iodine is absorbed by the growing plant, but, by its affinity for hydrogen and the power of vegetation, is soon converted into hydriodic acid; 4th, the germination of seeds, which appear to have lost all vital powers, may frequently be excited by iodine. [*Bull. Univ.*

The Distance accomplished within one hour on the Liverpool and Manchester Rail-way.

IT has often been a subject of doubt whether the distance from Liverpool to Manchester could be travelled by a locomotive engine in the space of one hour. This extraordinary feat was performed on Tuesday morning, (Nov. 23,) by the Planet, one of Mr. Stephenson's most approved engines—the time occupied being only 60 minutes, of which two minutes were taken up in oiling and examining the machinery about midway. There were no carriages attached to the engine; the only persons on the tender being the engineer, the fireman, and Mr. Williams, the principal clerk in the Liverpool Crown street station. [*Manchester Mercury.*

Preservation of Iron from Rust.

A MASTIC or covering for this purpose, proposed by M. Zeni, and sanctioned by the Societé d'Encouragement, is as follows: eighty parts of pounded brick, passed through a silk sieve, are mixed with 20 parts of litharge; the whole is then rubbed up by the mullar with linseed oil so as to form a thick paint, which may be diluted with spirits of turpentine; before it is applied the iron should be well cleaned.

From an experience of two years, upon locks exposed to the air, and watered daily with salt water, after being covered with two coats of this mastic, the good effects of it have been thoroughly proved.

[*Bull. d'Encour.*

To Readers and Correspondents.

THE Committee on Publications, anxious to render this work as valuable as possible, have determined to offer a liberal compensation for original articles on the subjects to which this journal is devoted; and they accordingly invite men of science and mechanics to communicate their observations. Every article published will be liberally paid for.

All communications must be addressed, *free of expense*, to *Wm. Hamilton, Actuary of the Franklin Institute, Philadelphia.*

Meteorological observations for February, 1831.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2, P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain and snow.	State of the weather, and Remarks.	
				Inches	Inches.			Inches.		
	1	31°	34°	29.30	29.40	W. N. W.	Blustering.		Cloudy.	Thawing.
	2	29	38	.90	30.00	W. W.	Moderate.		Clear.	Flying Cl'ds.
	3	26	32	30.00	29.70	S. E. S. E.	do.	.90	Cloudy.	Snow.
☾	4	25	24	29.40	.95	W. W.	Blustering.		Clear.	Clear.
	5	10	20	.65	.75	do.	do.		Clear.	Flying Cl'ds.
	6	8	20	.95	30.00	do.	do.		Clear.	Clear.
	7	13	24	30.05	.05	do.	Calm.		Cloudy.	Cloudy.
	8	15	30	29.95	29.95	do.	do.		Clear.	Cloudy.
	9	16	20	.95	.95	do.	Blustering.		Clear.	Clear.
	10	9	22	30.00	30.00	do.	Moderate.		Clear.	Clear.
	11	12	34	29.82	29.75	do.	do.		Clear.	Clear.
⊗	12	19	24	30.00	30.00	do.	do.		Flying cl'ds.	Sun eclipsed.
	13	12	20	30.00	.35	do.	do.		Clear.	Clear.
	14	6	22	.60	.60	do.	do.		Clear.	Clear.
	15	10	37	29.65	29.95	N. W. S.	do.		Clear.	Cloudy.
	16	40	46	11.95	.74	S. W.	do.	1.02	Rain.	Cloudy.
	17	34	36	.65	.75	W. W.	Blustering.		Clear.	Clear.
	18	15	24	30.10	30.10	do.	do.		Clear.	Clear.
☽	19	30	44	30.00	29.70	S. W. W.	Moderate.		Clear.	Clear.
	20	33	32	29.90	.30	N. W. W.	do.		Clear.	Clear.
	21	15	28	30.44	30.44	S. E. S.	do.		Clear.	Clear
	22	22	34	.15	.15	do.	Calm.		Cloudy.	Rain.
	23	42	40	29.30	29.30	S. S. W.	Moderate.	1.00	Rain.	Rain.
	24	27	31	.73	.83	W. N. W.	Blustering.		Clear.	Clear.
☉	25	21	30	.93	.90	N. W.	do.		Clear.	Clear.
	26	24	37	30.05	30.10	W. W.	Moderate.		Clear.	Clear.
	27	27	42	.10	.15	W. E.	do.		Clear.	Clear.
	28	30	46	.15	.15	E. S.	do.		Clear.	Clear.
	Mean	21.46	31.11	29.91	29.97			2.92		

	Thermometer.	Barometer.
Maximum height during the month,	46. on the 16th and 28th,	30.60 on the 14th.
Minimum do. . . .	6. on the 14th, . .	29.30 on the 1st, 20th, and 23d.
Mean do. . . .	36.28	29.94
Water fallen in snow and rain, 2.92 inches.		

NOTE.—During the solar eclipse the Thermometer in the shade fell 2 degrees. A meteorological register kept at Springfield, Clark county, Ohio, about lat. 39° 57′ N. and communicated to us, gives 17.66 for the mean temperature of the month of January at sun rise, which is nearly 3½ degrees lower than the mean at sun rise as given in our table for January.